ENGINEERING CHANGE NOTICE

1. ECN № 175543

Proj. ECN

2. ECN Category (mark one) Supplemental [ ] Direct Revision [X] Change ECN [ ] Temporary [ ] Supersedure [ ] Discovery [ ] Cancel/Void [ ]	3. Originator's Name, Organization, MSIN, and Telephone No. D.R. Herman 200 Area Steam & Water Utilities S4-01 3-4069		4. Date 11/17/92
	5. Project Title/No./Work Order No. SAP for the 284W Powerplant & 277W Fab Shop Process Wastewater Streams	6. Bldg./Sys./Fac. No. 284W Powerplant	7. Impact Level 1EQ 3/1
	8. Document Number Affected (include rev. and sheet no.) WHC-SD-WM-PLN-033 Rev. 2/1	9. Related ECN No(s). N/A	10. Related PO No. N/A

11a. Modification Work	11b. Work Package Doc. No.	11c. Complete Installation Work	11d. Complete Restoration (Temp. ECN only)
[ ] Yes (fill out Blk 11b) [X] No (NA Blks. 11b, 11c, 11d)	N/A	N/A Cog. Engineer Signature & Date	N/A Cog. Engineer Signature & Date

12. Description of Change

Revision to document is from comment incorporation.

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13a. Justification (mark one)	13b. Justification Details
Criteria Change [X] Design Improvement [ ] Environmental [ ] As-Found [ ] Facilitate Const. [ ] Const. Error/Omission [ ] Design Error/Omission [ ]	New Criteria identified and specified by DOE and internal reviewers

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A-7900-013 (11/88)

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1)
№ 175543

15. Design Verification Required	16. Cost Impact				17. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
☐ Yes	Additional ☐	$	Additional ☐	$	Improvement ☐	
☒ No	Savings ☐	$	Savings ☐	$	Delay ☐	

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	☐	Seismic/Stress Analysis	☐	Tank Calibration Manual	☐
Functional Design Criteria	☐	Stress/Design Report	☐	Health Physics Procedure	☐
Operating Specification	☐	Interface Control Drawing	☐	Spares Multiple Unit Listing	☐
Criticality Specification	☐	Calibration Procedure	☐	Test Procedures/Specification	☐
Conceptual Design Report	☐	Installation Procedure	☐	Component Index	☐
Equipment Spec.	☐	Maintenance Procedure	☐	ASME Coded Item	☐
Const. Spec.	☐	Engineering Procedure	☐	Human Factor Consideration	☐
Procurement Spec.	☐	Operating Instruction	☐	Computer Software	☐
Vendor Information	☐	Operating Procedure	☐	Electric Circuit Schedule	☐
OM Manual	☐	Operational Safety Requirement	☐	ICRS Procedure	☐
FSAR/SAR	☐	IEFD Drawing	☐	Process Control Manual/Plan	☐
Safety Equipment List	☐	Cell Arrangement Drawing	☐	Process Flow Chart	☐
Radiation Work Permit	☐	Essential Material Specification	☐	Purchase Requisition	☐
Environmental Impact Statement	☐	Fac. Proc. Samp. Schedule	☐		☐
Environmental Report	☐	Inspection Plan	☐		☐
Environmental Permit	☐	Inventory Adjustment Request	☐		☐

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Document Number/Revision	Document Number/Revision	Document Number/Revision

20. Approvals

OPERATIONS AND ENGINEERING	Signature	Date	ARCHITECT-ENGINEER	Signature	Date
Cog./Project Engineer	DR Lerman	11-17-92	PE		
Cog./Project Engr. Mgr.	[signature]	11/17/92	QA		
QA	R.J. Hing	11-17-92	Safety		
Safety			Design		
Security			Other		
Proj.Prog./Dept. Mgr.					
Def. React. Div.					
Chem. Proc. Div.					
Def. Wst. Mgmt. Div.			DEPARTMENT OF ENERGY		
Adv. React. Dev. Div.				William A. White	3/18/93
Proj. Dept.					
Environ. Div.	[signature]	11-17-92	ADDITIONAL		
IRM Dept.					
Facility Rep. (Ops)					
Other	[signature]	18 Nov 92			

9413206.1492

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1) № 175543

15. Design Verification Required	16. Cost Impact ENGINEERING		16. Cost Impact CONSTRUCTION		17. Schedule Impact (days)	
☐ Yes	Additional ☐	$	Additional ☐	$	Improvement ☐	
☒ No	Savings ☐	$	Savings ☐	$	Delay ☐	

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Equipment Spec.	☐	Maintenance Procedure	☐	ASME Coded Item	☐
Const. Spec.	☐	Engineering Procedure	☐	Human Factor Consideration	☐
Procurement Spec.	☐	Operating Instruction	☐	Computer Software	☐
Vendor Information	☐	Operating Procedure	☐	Electric Circuit Schedule	☐
OM Manual	☐	Operational Safety Requirement	☐	ICRS Procedure	☐
FSAR/SAR	☐	IEFD Drawing	☐	Process Control Manual/Plan	☐
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Environmental Permit	☐	Inventory Adjustment Request	☐		☐

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Document Number/Revision	Document Number/Revision	Document Number/Revision

20. Approvals

OPERATIONS AND ENGINEERING	Signature	Date
Cog./Project Engineer	D R Lerman	11-17-92
Cog./Project Engr. Mgr.	[illegible]	11/17/92
QA	R J Hing	11-17-92
Safety		
Security		
Proj.Prog./Dept. Mgr.		
Def. React. Div.		
Chem. Proc. Div.		
Def. Wst. Mgmt. Div.		
Adv. React. Dev. Div.		
Proj. Dept.		
Environ. Div.	A P Smith	11-17-92
IRM Dept.		
Facility Rep. (Ops)		
Other	[illegible]	18 Nov 92

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ID Number (include revision, volume, etc.): WHC-SD-WM-PLN-033 Rev 2

List attachments.

Date Release Required

Title: Sampling & Analysis Plan for the 284W Powerplant & 277W Fabrication Shop Process Wastewate Streams

Unclassified Category: UC-

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Information conforms to all applicable requirements. The above information is certified to be correct.

	Yes	No
References Available to Intended Audience	☒	☐
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Author/Requestor (Printed/Signature) Date

D.R. Herman DR Herman 11-17-92

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Responsible Manager (Printed/Signature) Date

E. Yusis [signature] FOR E. Yusis 11/17/92

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SUPPORTING DOCUMENT

1. Total Pages 81

2. Title	3. Number	4. Rev. No.
Sampling and Analysis Plan for the 284W Area Powerplant and 277W Fabrication Shop Process Wastewater Streams.	WHC-SD-WM-PLN-033	Rev 2

5. Key Words

SAP, 284W Powerplant, Sampling Plan

6. Author

D. R. Herman
Name (Type or Print)

Signature

55300/ A2D92
Organization/Charge Code

7. Abstract

This Sampling and Analysis Plan (SAP) establishes the guidelines for providing data to support a waste designation for each liquid effluent.

APPROVED FOR
PUBLIC RELEASE
V. Birkland 11/25/92

9. Impact Level

1 EQ

10. RELEASE STAMP

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Rev 2

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RECORD OF REVISION	(1) Document Number WHC-SD-WM-PLN-033	Page 1

(2) Title

Sampling and Analysis Plan for the 284W Area Powerplant and 277W Fabrication Shop Process Wastewater Streams

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change – Replace, Add, and Delete Pages	Authorized for Release		
		(5) Cog./Proj. Engr.	(6) Cog./Proj. Mgr.	Date
RS 2	(7) EDT - ~~161266~~ 157742 (initials 3/19/93) Complete revision to document in accordance with ECN #175543	D.R. Herman (signature)	E. Yusis (signature)	3/18/93

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Sampling and Analysis Plan of the 284 W Area Powerplant and 277 W Fabrication Shop Process Waste Water Streams

Prepared for Westinghouse Hanford Company
Richland, Washington
Under Contract DE-AC06-76RLO 1830

Prepared by
CH2M HILL
Bellevue, Washington 98009
April 1992

for Environmental Management Operations
under a Related Services Agreement
with the U.S. Department of Energy

Revised by
Westinghouse Hanford Company
November 1992

Environmental Management Operations
Richland, Washington 99352

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SUMMARY

The objective of the Sampling and Analysis Plan (SAP) is to address the requirements of the U.S. Department of Energy Order 5400.1, *General Environmental Protection Plan** and the May 21, 1991, proposed amendments to the *Hanford Federal Facility Agreement and Consent Order***, commonly called the Tri-Party Agreement. Specific requirements addressed in this SAP include the following.

- Provide sufficient data to support a waste designation for each liquid effluent.
- Provide data for potential use in *Washington Administrative Code* (WAC) 173-240*** engineering reports for a Washington State Discharge Permit, if needed.
- Provide sufficient data on chemical and radiological constituents to assist in making an estimate of constituent loading and their potential rate of migration to support an assessment of potential impacts of continued discharge.
- Support process design of waste water treatment projects, if necessary.

This plan describes the 284 W Powerplant and the 277 Fabrication Shop. Sample collection is described, including collection methodology, location of collection points, frequency of collection, equipment decontamination, and chain of custody throughout the process. The plan details specific contaminants to be tested and references the specific testing methodology to be used for each. Radiological screening of samples, data management techniques, and quality assurance methods are discussed.

Previous analytical results are summarized in an appendix.

---

*DOE, 1988, *General Environmental Protection Program*, DOE Order 5400.1, U.S. Department of Energy, Washington, D.C.

**Ecology, EPA, and DOE, 1990, *Hanford Federal Facility Agreement and Consent Order*, 2 vols., as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

***WAC 173-240, 1990, "Submission of Plan and Reports for Construction of Wastewater Facilities," *Washington Administrative Code*, as amended, Washington State Department of Ecology, Olympia, Washington.

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CONTENTS

FIGURES

TABLES

ABBREVIATIONS/ACRONYMS

ASTM	American Society for Testing and Materials
CFR	*Code of Federal Regulations*
DO	dissolved oxygen
DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
EDMC	Environmental Data Management Center
EPA	U.S. Environmental Protection Agency
HEIS	Hanford Environmental Information System
HPLC	high performance liquid chromatography
HPT	health physics technician
LEMIS	Liquid Effluent Monitoring Information System
Liquid Effluent QAPP	*Liquid Effluent Sampling Quality Assurance Program Plan*
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MS/MSD	matrix spike and matrix spike duplicate
MSDS	materials safety data sheet
OSM	Office of Sample Management
PCB	Polychlorinated biphenyl
psi	Pounds per square inch
QA	quality assurance
QAPP	Quality Assurance Program Plan
QC	Quality control
RCRA	*Resource Conservation and Recovery Act of 1976*
SAP	Sampling and Analysis Plan
S&ML	Sampling and Mobile Laboratories
SDWS	Secondary Drinking Water Standards
TDS	total dissolved solids
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
VOA	volatile organic analysis
WAC	*Washington Administrative Code*
WHC	Westinghouse Hanford Company

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A.0 SAMPLING OBJECTIVES

The following are primary objectives of the Sampling and Analysis Plan (SAP).

- Obtain several sets of known quality data to develop a long-term sampling plan.
- Confirm the analyte concentration data reported in the stream specific reports and the conclusion that the stream does not contain dangerous waste, as defined in *Washington Administrative Code* (WAC) 173-303, "Dangerous Waste Regulations," as amended (Ecology 1990a).

The following are secondary objectives.

- Provide highly quality controlled data for the evaluation of routine process sampling methods so that existing data can be evaluated and used.
- Provide solid waste loading data to support development of waste water treatment projects and groundwater remediation studies.
- Provide historical data for the WAC 173-240 (Ecology 1990c) engineering reports and WAC 173-216 (Ecology 1990b) waste discharge permit applications.

The sampling program is based on addressing these objectives and has been tailored based on available information (see Section D.0). The results of this sampling program should provide reproducible, representative waste water characterization. Sampling and analyses will be carried out consistent with the provisions of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1990) and Federal and State regulatory requirements and guidance. Any amendment to this document will be considered a Class III change to the Tri-Party Agreement once this document is approved by the regulatory agencies. Revisions of this document would be under the direction of the facility manager according to standard Westinghouse Hanford Company (WHC) procedures.

A.1 INTRODUCTION

This SAP addresses the requirements in the U.S. Department of Energy (DOE) Order 5400.1, *General Environmental Protection Program*, (DOE 1988) and the May 21, 1991, proposed amendments to the Tri-Party Agreement (Ecology et al. 1990). It is the policy of DOE and WHC to protect the public and the environment through collection of effluent characteristic data that can be compared to the requirements of applicable Federal, State, and local regulations.

The SAP provides detailed descriptions of field procedures and methods that will be used to characterize the chemical and radiological constituents of the process waste water generated by the 284 W Powerplant and the 277 W Fabrication Shop in the 200 West Area of the Hanford Site. The requirements in this document are in addition to the *Liquid Effluent Sampling Quality Assurance Program Plan* (Liquid Effluent QAPP) (WHC 1992). This plan includes discussions of the following:

- Sampling objectives
- Project organization and responsibilities
- Site background
- Rationale for selecting sampling locations and frequencies
- Analytical parameters
- Field parameter measurements
- Radiological screening
- Sample collection methodology
- Health and safety
- Documentation
- Equipment decontamination
- Sample custody and transport
- Data management
- Quality assurance.

The SAP is to be used in conjunction with the Liquid Effluent QAPP (WHC 1992) and an applicable health and safety plan. The program complies with the requirements in the *Quality Assurance Program Plan for the Facility Effluent Monitoring Plan*, WHC-EP-0446 (WHC 1991b).

B.0 SITE BACKGROUND

The Hanford Site is a DOE facility located in Benton County, Washington. The 200 West Area is located in the south-central portion of the Hanford Site, south of the Columbia River. The 284 W Powerplant consists of three processing facilities: the 282 W Reservoir, the 283 W Water Treatment Plant, and the 284 W Powerhouse (see Figure B-1). The 284 W Powerhouse is a coal-fired steam plant that provides steam for 200 West Area operations. In total, four facilities contribute to the process waste water stream to be characterized: the three facilities listed above and the 277 W Fabrication Shop. Previously, only the 284 W Powerhouse waste water was sampled. Processes have changed, and other streams are now included in the liquid effluent. A new baseline needs to be established.

B.1 PROCESS DESCRIPTION

Reservoir and Water Treatment Plant

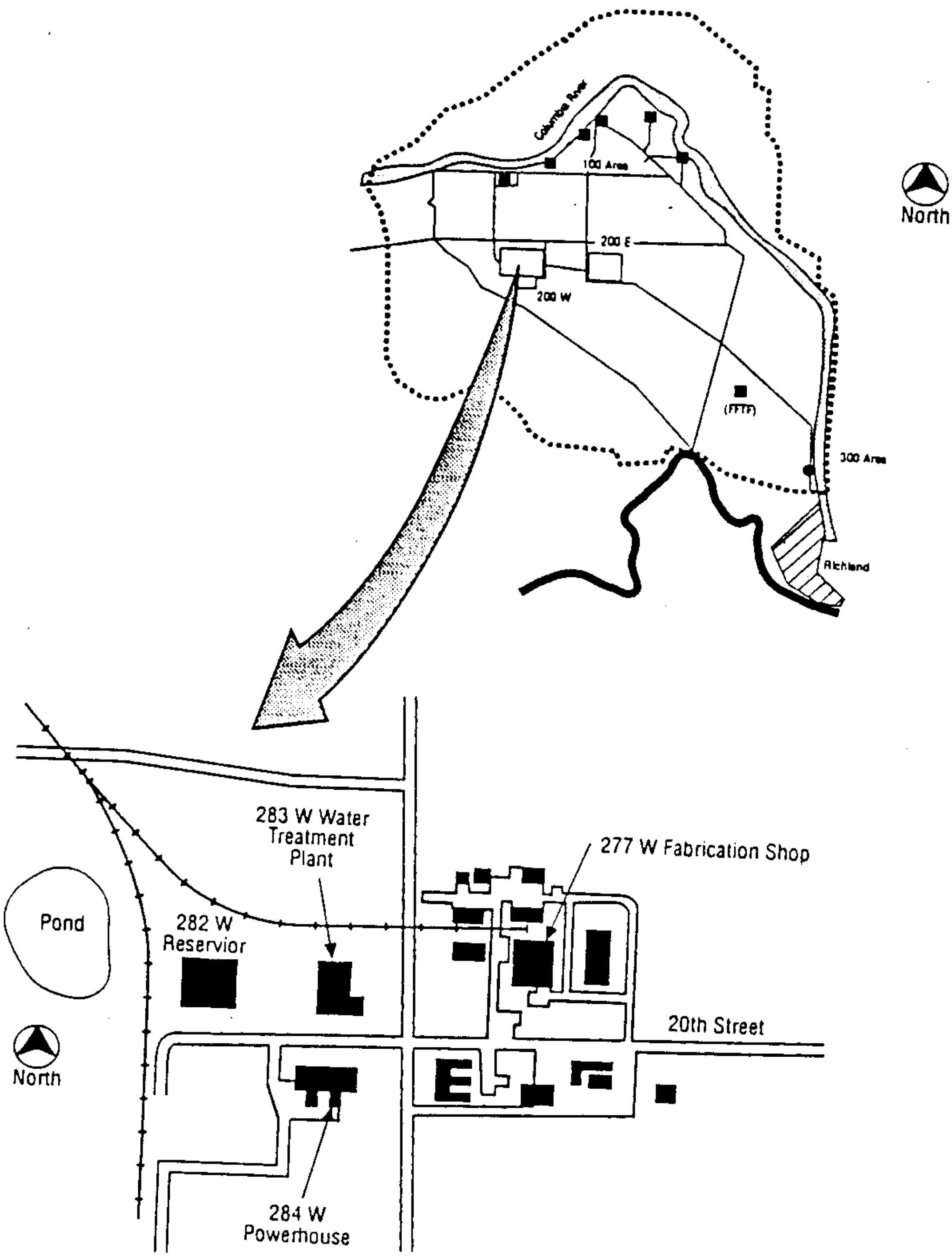
Water drawn from the Columbia River at the 100 B or 100 D Area is pumped to a 94,635,000-L (25,000,000-gal) reservoir located in the 100 Area. Water is pumped from there to the 11,356,200-L (3,000,000-gal) 282 W Reservoir and then pumped to the 283 W Water Treatment Plant (see Figure B-2). Alum (aluminum sulfate) is added to the water to neutralize electrically charged suspended particles and colloids. The alum-treated water is then sent through one of five flocculation basins and then into a settling basin. Overflow from the settling basin is filtered through one of four gravity multimedia filters consisting of four layers (ceramic, gravel, sand, and anthracite from bottom to top, respectively). The filters are backflushed four times a month to remove filtered materials or solids. The waste water flows into the combined waste water stream that discharges to the 284 WB Percolation Pond. The clean, filtered water is then chlorinated and stored in two covered clearwells with a total capacity of 1,514,160 L (400,000 gal). This treated water provides potable water to the 200 West Area.

Powerhouse

Sanitary (potable) water from the clear wells is sent to the 284 W Powerhouse where it is treated with sodium sulfite to destroy residual chlorine and then sent through a water softener to remove mineral hardness (i.e., calcium and magnesium). Polyquest* 683 (<4% potassium hydroxide) is added to the water to control corrosion and scale formation before introducing the water into the waterside of a coal-fired boiler. The powerhouse provides superheated steam (11 to 12 °C [52 to 54 °F]) above saturation temperature) at 225 pounds per square inch (psi). Super Filameen* 14 (nonhazardous amine derived from animal protein) is added to control condensate corrosion in the distribution piping. The steam generated at the 284 W Powerhouse is used in process facilities in the 200 West Area for heating and process operations (e.g., PFP-T Plant).

*Polyquest, and Super Filameen are trademarks of Grace Dearborn.

Figure B-1. Aerial View of 284 W Powerplant.



Source: WHC-EP-0342, addendum 27, 8/31/90, 284W Powerplant Wastewater, p 1-5, and personal communications, Ditterman, 1992

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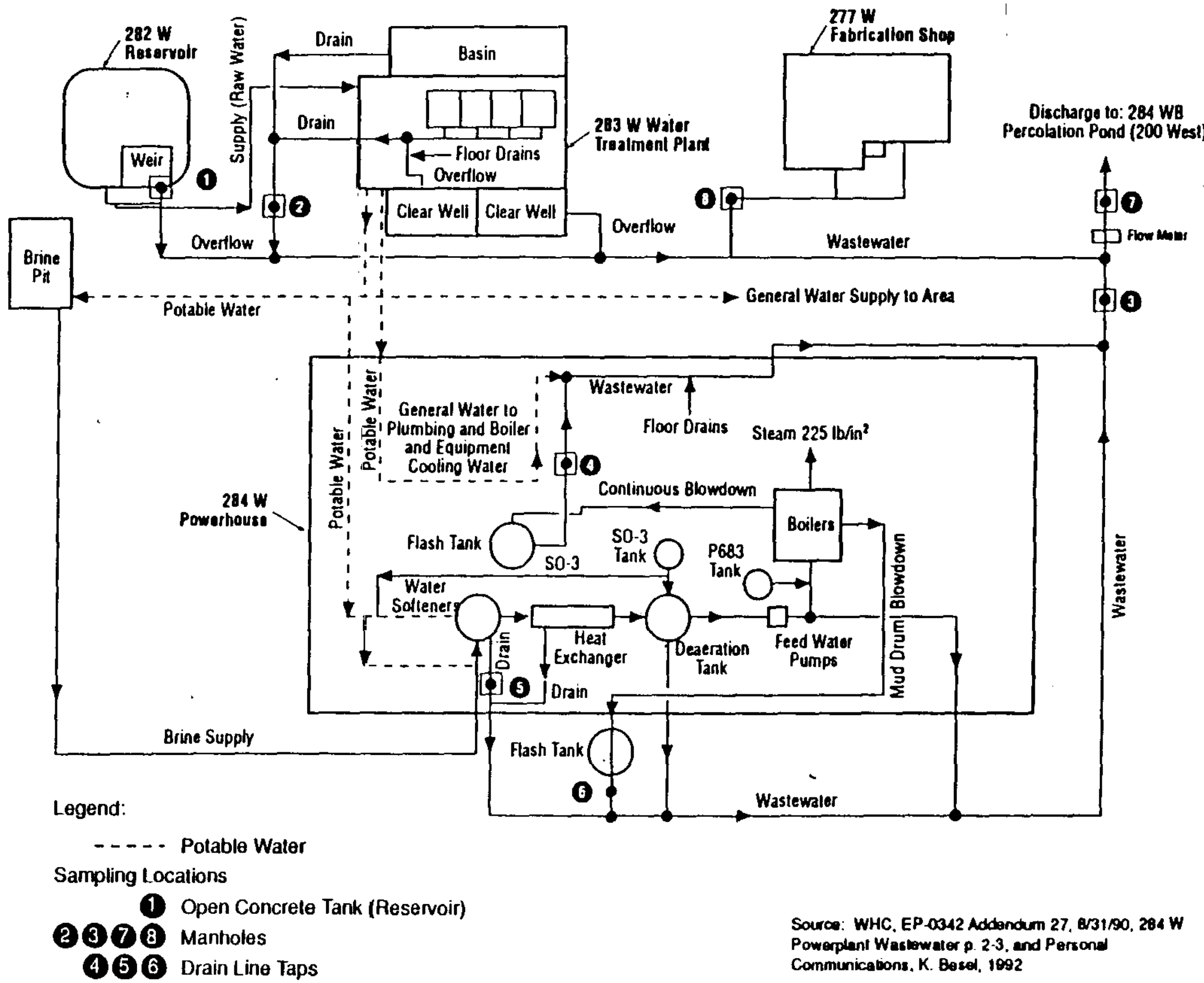

Source: WHC, EP-0342 Addendum 27, 8/31/90, 284 W Powerplant Wastewater p. 2-3, and Personal Communications, K. Besel, 1992

Figure B-2. Flow Schematic of the 284 W Powerplant.

A continuous boiler blowdown discharges to the waste water stream to keep the contaminant concentrations in the boiler water at operational levels. Once per shift, the heavier solids in the bottom of the boiler are discharged to the waste water stream ("mud drum blowdown"). Approximately twice a week, the water softener is regenerated using a salt brine solution created from water from the potable water supply; the used brine is discharged to the waste water stream.

Fabrication Shop

The 277 W Fabrication Shop, located upstream of the powerhouse, also discharges to the waste water stream. This shop fabricates metal parts and discharges approximately 16,656 L (4,400 gal) per week of equipment-cooling water to the waste water stream. Chemicals used in the Fabrication Shop include solvents and oils.

B.2 PROCESS CHANGES

Dearborn* 4846, 4856, and 4812 were previously used at the 284 W Powerhouse to reduce corrosion and scale formation in the boiler. The Dearborn compounds were replaced with Polyquest 683 in 1990. The use of potassium permanganate was discontinued in 1987, and methyl purple indicator replaced barium chloride in 1990. The potential exists for these compounds to appear in the chemical analyses conducted under this SAP, if residuals are present in portions of the piping.

If compounds are detected that are not readily tied to currently used chemicals, comparison of the analytical results to the material safety data sheet (MSDS) for these previously used compounds may aid in the interpretation of the data.

B.3 WASTE WATER STREAM DESCRIPTION

The 284 W Powerhouse, 283 W Water Treatment Plant, 282 W Reservoir, and 277 W Fabrication Shop contribute to the common process waste water discharged to the 284 WB Pond (see Figure B-2). A flow meter installed at the 284 WB Pond shows an average waste water flow of approximately 443 L/min (117 gal/min) entering the pond, depending on operation functions. This flow rate does not agree with the flows reported by operations; therefore, flow rates of the separate waste water streams will be measured as a part of the sampling effort. The largest contributors to the discharge at the pond are the reservoir, the powerhouse, and the water treatment plant. Table B-1 lists hazardous chemicals that may be introduced into the waste water stream. Table B-2 presents waste water contributors, sources, estimated amounts of waste water contributed by each source, and the approximate frequency of waste water discharged by each source. Flow rates for waste water sources at the 284 W Powerhouse will vary seasonally, with higher flow rates due to increased

*Dearborn is a trademark of Grace Dearborn.

Table B-1. Hazardous Chemicals Inventory.

Product Name	Uses	Potentially Hazardous Compounds
Alum	Flocculent	Aluminum sulfate
Salt	Water softener	Sodium chloride
Chlorine	Disinfectant	Chlorine gas
Lead (in gaskets/ valves)	In stored pump gaskets, valve packing	Lead
Mercury (in instruments)	In stored instruments	Mercury (metallic)
Polyquest 683[a]	Boiler water treatment	<4% Potassium hydroxide
Sulfuric acid	Battery banks	Sulfuric acid

[a]Polyquest is a trademark of Grace Dearborn and is used as an antiscalant/oxygen scavenger in the boiler water.
Source: WHC-EP-0472, p. 2-12 (WHC 1991a).

demand for steam heating throughout the 200 West Area during the colder months. Waste water generated from continuous boiler blowdown, mud drum blowdown, water softener regeneration, and equipment cooling at the 284 W Powerhouse is discharged to the floor trench or directly into floor drains that connect to the 284 WB Pond via vitrified clay pipes.

At the facilities (or contributors) listed in Table B-2, potential sources of dangerous or regulated materials are prevented from entering the effluent stream by using administrative and engineering controls. These controls include lock and tag procedures, source reduction (minimization), spill prevention, employee training in hazardous communications, MSDSs, waste handling, and emergency response practices. A detailed description of each effluent contributor follows (WHC 1991a).

282 W Reservoir

Water in the reservoir is pumped from the 100 B or 100 D Area River Pumphouse. Noncontact cooling water is used to cool the raw water turbine. The cooling water heater condensate and reservoir overflow are not expected to contain any dangerous or regulated materials.

283 W Water Treatment Plant

Water pumped from the 282 W Reservoir is treated with alum, filtered, chlorinated, and then stored as a source of potable water in two clearwells. Administrative and engineering controls are used in the plant to prevent sources of water contributing to the effluent stream (listed in Table B-2) from coming into contact with dangerous or regulated materials. The resulting

Table B-2. Contributors to Flow into 284 WB Pond[a].

Contributor	Source	Discharge[d]	Estimated amount contributed[e] (flow rate during discharge)
282 W Reservoir	Cooling water Pump strainer back flush water Heater condensate	C B C	1,325 L/min (350 gal/min)
	Reservoir overflow	B	26,498 L/min (7,000 gal/min)
283 W Water Treatment Plant	Filter backwash[b] Floor drains Heater condensate Cooling water Basin wash down water Clearwell overflow Basin overflow Water testing and sampling station Continuous turbidity meter	B B C C B B B B C	8,831 L/min (2,333 gal/min)/filter x 4 filters x 4 backwash/month [264,978 L/min (70,000 gal/min)/ 30 min/filter x 4 filters x 4 backwash/month]
284 W Powerhouse	Cooling water	C	189 L/min (50 gal/min) with 2 boilers online [8,327,880 L/month (2,200,000 gal/month) with 2 boilers online]
	Continuous blowdown[b]	C	34 to 80 L/min (9 to 21 gal/min) [varies from 11,340 kg/hr (25,000 lb/hr) steam load using 2,044 L/hr (540 gal/hr), to 27,216 kg/hr (60,000 lb/hr) steam load using 565 L/min (1,246 gal/hr)]
	Mud drum blowdown[c]	C	4.32 L/min (1.14 gal/min)/ blowdown 189,270 L/month (50,000 gal/month)
	Water softener regeneration[b]	B	212 to 254 L/min (56 to 67 gal/min) 8 x month (37,854-45,425 L [10,000-12,000 gal]/3 hr 8 x month)
	Steam heater condensate	C	
277 W Fabrication Shop	Floor drains	B	Volume unknown but drains washed down 3-4 time/year
	Cooling water	C	1.7 L/min [.44 gal]/min (7,912 L [2,090 gal]/wk + 9,085 L [2,400 gal]/wk = 16,656 L [4,400 gal]/wk total)
	Steam jet condensate	B	
	Fire water blowdown	B	189 L (50 gal)/year
	Hydrotesting	B	37,854 L (10,000 gal)/test

[a] All flow estimates taken from WHC-EP-0342 Addendum 27 (WHC 1990).
[b] Based on information supplied by plant operations. There are four filters in 283 W Water Treatment Plant.
[c] Based on 189,270 L/month (50,000 gal/month) (information provided by plant operations).
[d] Identification of discharge type: B = batch, C = continuous.
[e] Flow quantities not shown are nominal.

effluent stream is not believed to be a dangerous waste; however, filter backwash water and basin washdown water are anticipated to be high in suspended solids and metals, including aluminum.

284 W Powerhouse

Sanitary (potable) water from the 283 W Water Treatment Plant is treated with sodium sulfite to destroy residual chlorine and then passed through a water softener to remove calcium and magnesium before introducing the water into the boiler. This aids in minimizing scaling on the tube bundles in the boiler. When the resin in the ion exchange column inside the water softener becomes saturated, the resin is regenerated by passing 9 percent sodium chloride solution through the ion exchange column. Lock and tag procedures are used on control valves so that a concentration of not more than 9 percent sodium chloride is used or discharged to the effluent stream.

Noncontact cooling water is used to cool boiler feed pumps, stoker bearings, water jackets, air compressors, and some fans. Because the cooling water does not come into contact with the equipment, it is not anticipated to be a source of concern.

To minimize potential sources of dangerous or regulated wastes from entering the floor drains located throughout the powerhouse, pump wells (sumps) have been plugged, and floor drains within 1.5 m (5 ft) of any pump have been plugged.

During steam production, minerals not removed in the water softener process collect in the boiler. Two separate blowdown operations are used to remove these minerals: continuous and mud drum. Continuous blowdown is ongoing anytime a boiler is in operation. A sample of the continuous blowdown will be indicative of the quality of steam leaving the boiler and will be composed of a mixture of steam and water. Mud drum blowdown occurs once per shift to remove solids that have accumulated in the boiler. Blowdown effluent contains the antiscaling and oxygen scavenging compound Polyquest 683, which is not considered a dangerous waste after introduction into the process. This is based on the concentration used when this chemical is mixed with water in the mixing tanks before entrance into the boiler.

277 W Fabrication Shop

The floors in the machine shop and boiler shop are washed down three to four times per year. Water used for hydro testing is also discharged to the floor drains. Administrative controls are used to keep cutting oils and machine oils from being discharged to the floor drains.

Cooling water is used to continually cool the welding machine and compressor in the 277 W Machine Shop. A steam jet is occasionally used which produces steam condensate. Fire water blowdown occurs once per year and consists of discharging approximately 189 L (50 gal) of potable water.

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C.0 RESPONSIBILITIES

The program manager will be responsible for coordinating this SAP with the other liquid effluent SAPs, prepared under the Tri-Party Agreement, and for providing support and technical guidance to the facility manager.

The facility manager will be responsible for overall execution of the project and for environmental compliance. Responsibilities include planning, staffing, scheduling, and coordinating field activities.

The sampling and analysis task leader will be responsible for coordinating sampling and analysis activities, including scheduling operators and health physics technicians (HPT) to support the sampling team, reviewing field logs and sampling techniques, tracking sample chain of custodies and data, and seeing that analytical data is filed with the Environmental Data Management Center (EDMC). The task leader will also assist the facility manager with maintaining site-specific sampling schedules, authorizing changes to the sampling and analysis plan, and keeping management informed of potential impacts of schedule deviations on individual and programwide schedules and budgets.

The sampling team, from Sampling and Mobile Laboratories (S&ML) or a qualified subcontractor, will coordinate directly with operations staff to determine when discharges will be occurring and to schedule sample collection accordingly. Hanford Environmental Information System (HEIS) will provide the sample team with sample labels with a unique sample number. WHC will provide sample bottles.

Sampling and Mobile Laboratories shall do the following.

- Provide trained samplers for liquid effluent characterization sampling activities. One sampler shall have a WHC Certificate of Qualification from the S&ML group. A certificated sampler shall direct liquid effluent characterization sampling, packaging, and shipping.
- Prepare the plant liquid effluent characterization sampling procedure.
- Document sampling activities in a log book.
- Transport liquid effluent characterization samples to laboratory or shipping center.
- Initiate "chain-of-custody" documentation for liquid effluent characterization samples.
- Package liquid effluent characterization samples for shipping.
- Ensure copies of field logs and other sampling data sheets are forwarded to the plant cognizant engineer.

Protocol samples (hereafter called samples) meeting the quality assurance (QA) criteria of U.S. Environmental Protection Agency (EPA) SW-846 (latest edition) criteria will be collected by S&ML or the designated sampling team. Protocol samples shall be collected according to an approved written procedure. The sampling procedure will comply with the requirement established in EPA SW-846 (latest edition). The sampling team will make a written record of the sampling as discussed in Section E.3. Once the protocol or baseline samples are taken and analyzed, routine monitoring or process samples specific to the process will be identified.

The Office of Sample Management (OSM) or designee will participate in the evaluation and selection of a laboratory or laboratories to perform the needed analysis. These laboratories must meet the criteria of this SAP and the Liquid Effluent QAPP (WHC 1992).

Environmental samples being sent from the Hanford Site must undergo a radiological screening analysis to monitor radiological activity exceeding the Hanford Site release limits. Arrangements will be made by S&ML with the 222 S Laboratory to meet this requirement.

Facility Quality Assurance will provide surveillance of the liquid effluent characterization sampling program and will audit surveillance records and procedures.

Data resulting from sampling will undergo two levels of review and validation: within the laboratory and outside the laboratory. Initial data reduction, validation, and reporting at the laboratory will be carried out as described in the Liquid Effluent QAPP (WHC 1992). Completed data packages will be validated by OSM, a qualified individual designated by the facility manager, or a qualified subcontractor. The validated data will be stored and managed in a liquid effluent sampling database. Hard copies of validated data will be retained in the Administrative Record Vault by EDMC.

The EPA and Washington State Department of Ecology (Ecology) will have a regulatory oversight role in this project so that the requirements of the Tri-Party Agreement (Ecology et al. 1990) are met. Staff from these regulatory agencies may choose to visit the site, collect split samples during sampling, or visit the analytical laboratory to observe the work being performed.

D.0 SAMPLING LOCATIONS AND FREQUENCIES

D.1 FIELD APPROACH

Sampling locations were chosen based on process knowledge, the configuration of the waste water discharge piping, and probable accessibility. These sampling locations are also strategically located on the effluent streams from particular operations. The time of sample collection will be directly related to the various operations and a predetermined periodic, sampling schedule. The sampling team will coordinate with operations staff so that the samples are taken at the proper time during the discharges (as described below).

Eight sampling locations have been chosen based on the configuration of discharge lines from the different processes contributing to the overall discharge. A description of these processes and their waste water streams, a map (Figure B-1), and a flow schematic of the 284 W Powerplant area showing sampling locations (Figure B-2) are given in Section B. The eight sampling locations consist of an open concrete tank (the reservoir, sample location 1), four manholes (sample locations 2, 3, 7, and 8), two drainline sample taps (sample locations 4 and 5), and one drainline sample tap (sample location 6). To sample mud drum blowdown separately from the other waste water sources, a drainline sample tap has been installed at sample location 6.

The field effort to characterize the 284 W Powerplant waste water has been phased into the following four sequential field activities.

- Field Activity 1 will confirm that proposed sample locations are accessible and appropriate for waste water stream sample collection.

- Field Activity 2 tasks will focus on two objectives over two sequential weeks: collecting field measurements and evaluating a combined discharge. During the first week, flow rates and field parameters (conductivity, pH and dissolved oxygen) will be measured for each of the major waste water streams and in the common discharge. These data will verify that changes in field parameters (specifically, conductivity) track batch discharges downstream.

  Assuming the first week's activities confirm that changes in field parameters result from batch waste water discharges, then in the second week an attempt will be made to stagger the discharges so that they arrive at sample location 7 at the same time. Field parameters will be used to verify that two sets of waste water samples were taken during the coincided batch discharges; these samples will be analyzed for a full set of chemical parameters (Appendix IX). Chemical results from this chemical sampling, in conjunction with waste stream data, should identify a subset of chemical analytes which are neither expected nor detected in the waste water process streams. These nondetected analytes will not be quantified in successive sampling.

- Field Activity 3 will extend sampling frequency to twice in FY 93 and twice in FY 94. Chemical analyses will be limited to the expected or detected analytes identified in Field Activity 2.

- Field Activity 4 will extend sampling frequency to four sequential quarters. Chemical analyses will be limited to the same subset of analytes identified during the initial chemical characterization sampling in Field Activity 2.

Table D-1 details the specific tasks to be performed during each of the four field activities. The following discussions describe the rationale for the phased approach and for the proposed locations and frequencies.

D.2 FIELD ACTIVITIES

The field effort consists of 4 Field Activities to evaluate the effectiveness of this sampling scheme (see Table D-1 for sampling details).

Field Activity 1, 2, and 3 will be performed during 1993 and 1994 to fully characterize the effluent waste stream. Field Activity 4 will be implemented after full characterization and validation of the effluent waste stream.

D.2.1 Field Activity 1

Because of the age of the facility, some of the available drawings did not adequately indicate whether certain manholes were tied to the discharge lines that need to be sampled. Consequently, some of the chosen sampling locations need to be checked before samples can be taken. A dye study will be performed to verify that the sample location is a strategic point on the waste water discharge (e.g., is the manhole chosen for sampling actually located on the discharge line in question?).

Field Activity 1 consists of conducting a dye study in the sewer lines to see if the manholes selected as sample locations 2 and 8 are tied to the discharge line in question. Access to sample locations 3 and 7 will be verified.

D.2.2 Field Activity 2

A review of existing data (see Appendix 2) indicated that variations in constituent concentrations could be tracked by measuring the conductivity of the waste water discharges. In other words, higher chemical constituent concentrations appear to result in higher conductivities. This finding is consistent with knowledge of the waste water streams that discharge from the 284 W Powerplant area. These waste water discharges would be expected to have concentrations of salts and solids above background levels. Assuming that the waste water constituents are fairly consistent from discharge to discharge (a reasonable assumption given the nature of the discharges), the magnitude of the change in conductivity for a given waste water discharge is expected to be

Table D-1. Field Activities and Sampling Frequencies.

4 sheets

Field Activity	Data/samples collected[a]/frequencies
Field Activity 1	• Conduct dye studies to verify the source of waste water for sample locations 2 and 8 (see Figure B-2 and Table E-1). Release dye into the process piping near the discharge point, upstream from the sample location and see if the dye shows up at the sample location. • Verify access to sample locations 3 and 7.
Field Activity 2, Week 1	• Measure flow and field parameters[b] only for 7 days. No samples will be collected for chemical analyses. • Collect flow data. • At sample locations 1, 2, 3, 7, and 8 (the reservoir and manholes), use DataSonde* 3 data loggers or similar equipment to collect continuous field parameter[b] data every 30 minutes. • At sample locations 4, 5 and 6 (drainline sample taps), use portable field instruments to collect manual measurements of field parameters[b] every 15 to 30 minutes from 1 hour before batch waste water discharge begins, continuing through to 1 hour after the batch waste water discharge ends. If the sample tap is on a continuous discharge (e.g., sample location 4), then samples should be taken every hour. Drainline sample taps should be opened for 1 minute before taking the manual measurement (see Section E.1). • Coordinate with the operations manager to determine when batch waste water discharges will occur and how long they last. • Examine the field parameter[b] data at the end of the week to see if each waste water batch discharge can be detected by its conductivity and if each batch discharge can be detected at sample location 7 by its conductivity.

*DataSonde is a registered trademark of Hydrolab Corporation.

Table D-1. Field Activities and Sampling Frequencies.

4 sheets

Field Activity	Data/samples collected[a]/frequencies
Field Activity 2, Week 2	• Measure flow and field parameters[b] for 7 days, as in Field Activity 2, Week 1. Measure these concurrently with the sampling described below. • Determine which waste water batch discharges can be detected at sample location 7 using conductivity. Those batch waste water discharges that cannot be detected at sample location 7 will be sampled individually (i.e., at sample locations 2, 3, 4, 5, 6 and 8, as appropriate) for the chemical analysis. • Coordinate directly with operations staff at 282 W Reservoir, 283 W Water Treatment Plant, 284 W Powerhouse, and 277 W Fabrication Shop to discharge all continuous and batch waste water discharges so that the batch discharges reach sample location 7 at the same time. The time lag needed for the waste water to travel through the piping system can be figured out based on the results of Field Activity 2, Week 1. This combined discharge is the waste water discharge pulse that will be sampled at sample location 7. • Collect waste water samples (24-hour composite, if possible, and grab[c]) using a sampler or similar equipment and a bailer one hour before the pulse or waste water discharge continuing until one hour after the end of each pulse or waste water discharge. Analyze samples collected for one hour before and for one hour after the pulse or waste water discharge for routine parameters only (indicated with an R in Table F-1). Analyze samples collected during the pulse for all the parameters listed in Appendix IX. • Take two rounds of samples during the week. • Review the analytical results to determine which parameters are of interest and the location of the sources of interest.

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Table D-1. Field Activities and Sampling Frequencies.

4 sheets

Field Activity	Data/samples collected[a]/frequencies
Field Activity 3	• Measure field parameters at the eight sample locations during sampling events. • Collect waste water samples from the sources of interest determined in Field Activity 2, Week 2 (sample location 7 and other sample locations, as discussed above). • Use the appropriate sample collection methodology for the type of location (tank, manhole, drainline sample tap) and sample type (24-hour composite or grab[c]). • Collect samples (i.e., four rounds of samples) during a single pulse and/or batch waste water discharge (coordinated by the sample team with operations staff as described above). • Samples collected for 1 hour before and for 1 hour after each pulse or batch waste water discharge will be analyzed for routine parameters (designated with an R in Table F-1) only. Samples collected during the pulse or batch waste water discharge will be analyzed for routine parameters and Appendix IX (40 CFR 264) parameters. • Examine the results to determine which sources of interest need further study. Any parameters not detected during Field Activity 2 and 3 will be eliminated from the parameters list for Field Activity 4.

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Table D-1. Field Activities and Sampling Frequencies.

4 sheets

Field Activity	Data/samples collected[a]/frequencies
Field Activity 4	• Measure field parameters at the eight sample locations during sampling events. • Collect one set of waste water samples once per quarter (e.g., January, April, July, and October) for 1 year at the same locations used in Field Activity 3, using the same collection methods.
	• Samples collected 1 hour before and 1 hour after a pulse or batch waste water discharge will be analyzed for any previously detected (in Field Activity 2 and/or 3) routine parameters only. Samples collected during the pulse or batch waste water discharge will be analyzed for previously detected routine parameters (as described above) and a subset of previously detected (in Field Activity 2 and/or 3) Appendix IX (40 CFR 264) parameters.

[a]Sample location 6 is the preferred location for sampling mud drum blowdown before it is mixed with other waste water stream.
[b]Field parameters consist of conductivity, pH, and dissolved oxygen.
[c]At manhole locations (1, 2, 3, 7, and 8) grab samples are volatile organics, sulfide, total organic halogens (TOX), and onsite radiation screen samples. At sample tap locations (4, 5, and 6) grab samples are collected for all the parameters listed in Table F-1.

consistent from discharge to discharge over time. Therefore, tracking conductivity should provide a reliable indicator parameter for tracking overall changes in the other constituents of the discharges.

D.2.2.1 Week 1. Because individual waste water discharges should have different conductivity magnitudes and different batch discharge cycles, the individual batch waste water discharges should be able to be monitored by measuring conductivity downstream, after several of the discharges come together. Field Activity 2, Week 1 evaluates the effects of the various waste water discharges on conductivity close to the discharge point (sample locations 2, 4, 5, 6, and 8) and at the end-of-pipe near the percolation pond (sample location 7). Sample location 3 is an intermediate location within the powerhouse discharge. Sample location 1 is the background sample location.

In Field Activity 2, Week 1, waste water flow and field parameters (conductivity, pH, and dissolved oxygen) will be measured for one week during routine operations of the powerplant area. This set of measurements will be used to verify whether conductivity can be used to track the batch discharges. Flow and the field parameters will be measured at, or near, the points of waste water generation (sample locations 2, 3, 4, 5, 6, and 8). These results will be compared to measurements taken at the "end of pipe" location (sample location 7). If a change in conductivity for each of the waste water discharges can be detected at sample location 7, then subsequent samples would be justifiably taken from sample location 7 for end-of-pipe samples. Sample locations whose associated discharges cannot be detected and measured at the "end of pipe" would be sampled separately.

During the above evaluation, field parameters will be measured continuously using a data logger (e.g., DataSonde 3) at sample locations 1, 2, 3, 7, and 8, where the probe can be continuously submerged. At the other locations, measurements will be taken manually every 15 to 30 minutes because data loggers cannot be used at these locations. The sampling team will coordinate with operations to find out when the batch discharges that must be manually monitored will occur. In the case of the manual monitoring, measurements will be taken one hour before, during, until one hour after batch waste water discharges take place (see Table D-1).

D.2.2.1 Week 2. Analysis of the field measurements (flow, conductivity, pH, and dissolved oxygen) should show when the batch discharges were occurring, how long it took a given batch discharge to reach a downstream sampling location, and if the batch discharge can be tracked by conductivity at a downstream sampling location. The field measurements will be evaluated to determine if conductivity can be used as an indicator parameter. The sample locations for chemical analysis in Field Activity 2, Week 2 would be chosen based on how far downstream conductivity can be used to track the individual batch waste water discharge.

In Field Activity 2, Week 2 of the sampling program, the 284 W Powerplant area processes will be coordinated so that the individual process discharges will arrive at the end-of-pipe sample location 7 at the same time. This combined discharge is the waste water discharge "pulse". Field measurements will continue to be taken at sample locations 1, 2, 3, 4, 5, 6, 7, and 8 during Field Activity 2, Week 2 so that conductivity can be used to trace the time the individual waste waters were discharged.

Samples will be taken before, during, and after the combined discharge. The samples taken during this combined discharge should be representative of the greatest total amount of dissolved solids and highest flow rate that could discharge to the environment at any one time, assuming that operations do not change significantly. During this activity, samples will be taken that are either grab samples or composite samples, depending on what is appropriate for a specific sample location or parameter (e.g., all volatile organics samples will be grab samples). The total discharge pulse will be sampled twice at the selected sample locations before, during, and after the discharge so that a representative sample is obtained. Analytical data from the two samples will be compared to determine if the samples are consistent. If this sampling does not adequately characterize the waste waters, more samples will be taken over a longer period of time to more fully characterize the waste water.

Samples collected before and after each pulse will be sent to an analytical laboratory for routine analyses as indicated with an R in Table F-1. Routine analysis parameters are those expected to be in the waste water stream based on available process knowledge and chemical data (see Table F-1). Samples collected during each pulse will be analyzed for all constituents listed in Table F-1, including the full 40 CFR 264 Appendix IX list of chemical constituents. The results will establish a constituent baseline for the combined waste water discharge. The results also will be used to determine if further testing and evaluation of the individual waste water sources are needed.

If the analytical results from the combined discharges do not exceed applicable regulatory concentrations, then it is assumed that the combined discharge can be monitored. If the analytical results show concentrations above applicable levels, then additional sampling on those discharge streams showing the highest conductivity may be needed to determine the actual concentration in the waste water stream causing the exceedences.

D.2.3 Field Activity 3

Once conductivity has been established as a characteristic that can be used to track the general quality of the batch discharges and a conductivity baseline has been established for the various discharges, conductivity can be used as the long-term routine monitoring parameter. If conductivity is measured in the field during routine discharges and a conductivity higher than the baseline is seen, it would be easy for the person measuring the discharge to take a sample for laboratory analysis. The constituents for laboratory analysis would be chosen based on the results of the long-term sampling in Field Activities 3 and 4.

Field Activity 3 of the sampling plan examines the variability of the field measurements, flow, and detected constituents in the combined waste water stream. The extent of anomalies, if detected, will be observed by collecting samples and analyzing them for routine analysis parameters (see Table F-1) as well as a corroborative subset of 40 CFR 264 Appendix IX constituents. The samples will be taken before, during, and after process pulses twice in FY 93 and twice in FY 94. A total of 12 samples (8 from before and after the pulses for routine analysis parameters and 4 from during the pulse for a subset of the Table F-1 constituents) will be collected and analyzed in Field Activity 3. Other sample locations may also need to be sampled (see Field Activity 2, Week 2). The results then will be evaluated; additional chemical constituents may be removed from the analysis list based on this evaluation.

Field parameters will continue to be taken at sample locations 1, 2, 3, 4, 5, 6, 7, and 8 during Field Activity 3 so that conductivity can be used to trace when each of the individual waste waters are discharged.

D.2.4 Field Activity 4

Field Activity 4 continues the waste water evaluation after characterization is completed. Samples will be collected quarterly and analyzed for routine and constituents and the subset of Appendix IX constituents that results from Field Activity 3. Samples will be collected on different days of the week and different weeks in the month to randomize the analytical data. A total of eight samples for routine analysis and four for a subset of the Table F-1 constituents will be collected from sample location 7 and analyzed in Field Activity 4. Other sample locations may also need to be sampled (see Field Activity 2, Week 2). Field parameters will continue to be taken at sample locations 1, 2, 3, 4, 5, 6, 7, and 8 during Field Activity 4 so that conductivity can be used to trace when each of the individual waste waters are discharged. As previously stated, this sampling plan is designed to meet the objectives listed in Section A.1.

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E.0 SAMPLE COLLECTION, IDENTIFICATION, AND HANDLING

Proposed sampling locations are listed in Table E-1.

Table E-1. Sample Locations[a].

Location	Sample Point
1	Open concrete reservoir, 282 W Reservoir
2	Manhole, outside 283 W Water Treatment Plant
3	Manhole, downstream, 284 W Powerhouse combined effluent
4	Drainline sample tap, 2nd floor 284 W Powerhouse continuous blowdown
5	Drainline sample tap, ground floor 284 W Powerhouse water softener blowdown
6	Sample tap for sampling mud drum blowdown, behind 284 W Powerhouse, discharge from flash tank
7	Manhole, above discharge to Pond 284 WB (end of pipe)
8	Manhole, outside 277 W Fabrication Shop

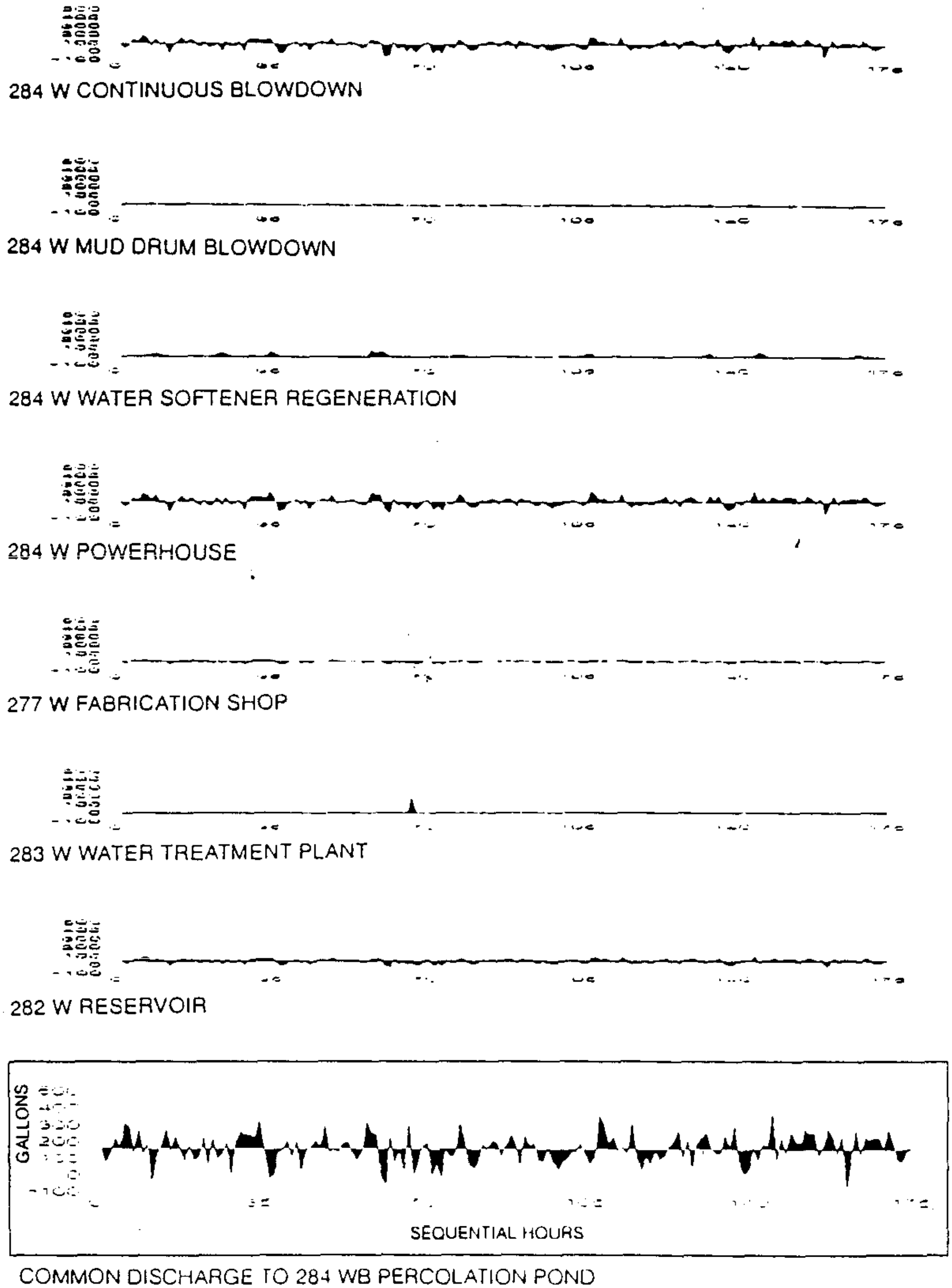
[a]Locations shown in Figure B-2.

Figure E-1 illustrates the frequency, duration, and volume of each of the processes contributing waste water to the 284 WB Percolation Pond. This figure is important because it illustrates the cyclical nature of the waste water discharges. The sampling team will coordinate directly with operations staff to determine when discharges will be occurring and to schedule sample collection accordingly. Doing this will help determine when and if all the processes can be discharged at one time during week 2 of Field Activity 2.

Waste water samples and field data will be collected as follows, based on available information (see Table D-1 for more information).

- **Field Activity 1**--Perform a dye study to determine if sample locations 2 and 8 are valid sampling locations, and verify access to manholes at sample locations 3 and 7.
- **Field Activity 2, Week 1**--Measure field parameters only (pH, conductivity, and dissolved oxygen) at five locations (sample locations 1, 2, 3, 7, and 8) for 1 week. Flow monitoring equipment will be used to record flow data.

Figure E-1. Waste Water Source Frequencies and Contributors to Total Blowdown.



- **Field Activity 2, Week 2**--Samples for chemical analysis will be taken 1 hour before, during, and 1 hour after each combined waste water discharge pulse. This sampling will occur twice during the week. Samples collected before and after the pulse will be analyzed for routine parameters; samples collected during the pulse will be analyzed for all the analytes listed in Appendix IX (40 CFR 264). Flow data and field parameters will also be collected.

- **Field Activity 3**--Samples collected for chemical analysis will be taken before, during, and after the combined waste water discharge pulse. Samples collected before and after the pulse will be analyzed for routine parameters; samples taken during the pulse will be analyzed for all the analytes listed in Appendix IX (40 CFR 264). Field parameters will also be collected.

- **Field Activity 4**--Samples will be collected and analyzed as in Field Activity 3, except that the samples will be collected once per quarter for four quarters to verify the consistency of the discharge. Field parameters will also be collected.

Field parameters will be monitored continuously using a DataSonde* 3 or equivalent data logger (assuming there is sufficient water to submerge the data logger probe). The DataSonde 3 is a submersible, multiparameter water quality probe and data logger manufactured by Hydrolab Corporation. Equipment may require calibration and maintenance according to management instructions. The probes will be installed in the manholes so that flow is not obstructed. Confined space entry will comply with the Industrial Safety Manual (WHC 1988). Flow data will also be collected and recorded in the field logbook at those sample locations where it can be collected. Sample locations 4, 5, and 6 will be monitored manually for field parameters at specified intervals before, during, and after batch waste water discharges using portable field monitoring equipment.

E.1 FIELD PARAMETER MEASUREMENTS

The DataSonde* 3 or similar equipment will be used at five locations (see Table D-1) to continuously monitor pH, conductivity, and dissolved oxygen. The unit is designed to remain in service for extended periods of time. The DataSonde 3 or similar equipment will be field calibrated and checked against standards according to the manufacturer's specifications at the beginning and end of week 1 of Field Activity 2. Information from the self-contained data logger will be downloaded using a personal computer communications program to a field computer at the end of the week. Calibration measurements will be recorded in the bound field logbook.

Samples from the drainline sample taps will be collected 15 to 30 minutes from 1 hour before each batch discharge until 1 hour after each batch discharge. If the sample tap is on a continuous discharge (e.g., sample location 4), then samples should be taken every hour. Prior to sample collection, the drainline sample taps at 4, 5, and 6 will be opened, and water

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*DataSonde is a registered trademark of Hydrolab Corporation.

will be discharged into a container for at least 1 minute to remove any debris or contaminants from the sample taps themselves. A clean cup or beaker will then be filled and used for field parameter measurements. Field parameters will be measured immediately after sample collection. The monitoring probes will be rinsed with RO/DI American Society for Testing and Materials (ASTM) Type II water before each measurement. The field meters used for these measurements will be calibrated in accordance with manufacturers' specifications using appropriate standard solutions. Field parameters and calibration measurements will be recorded in the bound field logbook. Refer to the Liquid Effluent QAPP (WHC 1992) for QA procedures for calibrating field instruments.

E.2 SAMPLE COLLECTION

During week 2 of Field Activity 2, 24-hour composite samples will be collected at selected sample location(s) using dedicated samplers or similar equipment as specified in S&ML procedures. Sample locations will be selected on the basis of field parameter data collected during Week 1 of Field Activity 2. The manholes will be monitored for radiation before entry. Required confined space entry will comply with the *Industrial Safety Manual* WHC-CM-4-3.

Grab samples at selected sampling locations will be collected directly from drainline sample taps or with dedicated stainless steel bailers with Teflon check valves. Bailers will be lowered on a monofilament line into the waste stream using a cord reel. The full bailer will be retrieved, and a Teflon stopcock will be inserted at the check valve so that flow from the bailer can be controlled. Likewise, the drainline sample tap will be used to reduce the flow rate when collecting samples for volatile organic analysis to minimize aeration of the sample and possible volatilization of organic compounds.

Equipment decontamination procedures and the disposal of contaminated materials are discussed in Section E.4, Equipment Decontamination.

Field quality control samples will be collected as part of the field sampling effort. Field quality control samples may include equipment blanks, field blanks, trip blanks, and duplicate samples. The analytical schedule for the field quality control samples is shown in Table E-2. The frequency of quality control sample collection is described below and discussed further in Section 10.0 of the Liquid Effluent QAPP (WHC 1992).

- **Field Duplicates**--For each phase of sampling activity, a minimum of 5 percent of the total collected samples will be duplicated. Duplicate samples will be retrieved from the same sampling location using the same equipment and sampling technique and will be placed into two sets of identically prepared and preserved containers.

- **Field Blanks**--Field blanks will be transferred into a sample container at the site, and preserved with the reagent specified for the analytes of interest. Field blanks are used as a check on reagent and environmental contamination and will be collected at a minimum frequency of 5 percent of the total number of samples taken.

Table E-2. Analytical Schedule for Field Quality Control Samples.

Parameter group[a]	Sample type			
	Duplicates	Field blanks	Equipment blanks	Trip blanks
Volatile organics[a]	X	X	X	X
Semivolatile organics[a]	X		X	
Pesticides and polychlorinated biphenyl (PCB)[a]	X		X	
Herbicides[a]	X		X	
Dioxins and furans[a]	X		X	
Metals[a]	X		X	
Radionuclides[b]	X		X	
Field parameters[b]	X			
General parameters[c]	X		X	

[a]Individual constituents in each parameter group are presented in Tables 3-1 through 3-7 in Appendix 3.
[b]See Table F-1.
[c]See Table 3-7 in Appendix 3.

- **Equipment Blanks**--Equipment blanks will consist of RO/DI ASTM Type II water washed through decontaminated sampling equipment and placed in containers identical to those used for actual field samples prior to sampling event. Equipment blanks are used to verify the adequacy of sampling equipment decontamination procedures and will be collected at a minimum frequency of 5 percent of the total number of samples taken.

- **Trip Blanks**--Trip blanks consist of RO/DI ASTM Type II water added to one or two clean septum-sealed vials, accompanying each batch of containers shipped to the sampling activity. Trip blanks will be prepared by the S&ML, stored with the samples, and returned unopened to the laboratory. Trip blanks are a check on possible volatile organic compound contamination originating from container preparation methods, shipment, handling, storage, or site conditions. Trip blanks will accompany each shipment of samples scheduled for volatile organic analysis. Trip blanks will be prepared and analyzed at a minimum frequency of 5 percent. However, the project manager or laboratory personnel may elect to analyze additional trip blanks if unusually high or otherwise unexpected concentrations of volatile organics are detected in the field samples.

Sample collection during Field Activities 3 and 4 will use similar methodology. See Table D-1 for details.

E.3 SAMPLE DESIGNATION AND FIELD DOCUMENTATION

Sample bottles will be tracked from the point of sample origin to the laboratory in accordance with a chain-of-custody system described in Section E.5, Sample Custody and Transport. A unique sample number will be obtained from HEIS.

The bottles will be labeled with these numbers. Also, each bottle will be identified with a bar code sticker attached to the bottle by the bottle manufacturer. The bar code will identify the bottle lot number and individual bottle number. Additional information recorded on the label will include the following:

- Time sample was collected to the nearest minute using a 24-hour clock (military time system)
- Analysis
- Preservative
- Sampler's initials and name printed
- Type and matrix of sample (i.e., grab or composite, water or waste water).

The sampling team shall maintain a written record of sampling activities and field observations in a bound field logbook and recorded on a sample authorization form. All logbook entries shall be completed in nonerasable black ballpoint ink. Any required corrections to the information in the logbook will be made by drawing a line through the erroneous information, entering the correct information, and initialing and dating the change. The erroneous information should remain legible.

At a minimum, the following information should be noted in the bound field logbook:

- All information required under Section 6.1 of the Liquid Effluent QAPP (WHC 1992)
- Field observations (e.g., temperature, windy day, dusty day, raining)
- Sampling point and method
- Date, time, and sample identification number for each sample collected
- Type and matrix of sample being collected (i.e., grab or composite, water or waste water)

- Scheduled analyses for each sample collected
- Qualitative indication of sample turbidity and color
- Field parameter measurements, other sample survey information, and time they were measured
- Dot numbers and expiration dates for calibration solutions and gases
- Equipment manufacturer, model number, and serial number
- Names of sampling personnel and HPT
- Radiological screening results for each sample
- Deviations from procedure described in this SAP
- Daily signatures for each person making logbook entries
- Sketches, drawings, if appropriate
- Record of the vehicle number used to transport the samples and the destination of the samples
- Chain-of-custody numbers cross referenced to sample identification numbers
- Any other pertinent information (e.g., note deviations from the intended sampling method)

All sampling personnel who enter data must sign and date each page of logbook entries. All changes to logbook entries must be initialed and dated. During field activities, the field logbook will be kept under the control of the field team. Upon completion of the field effort, the field logbook will be managed in accordance with QR 17.0, "Quality Assurance Records" (WHC 1989).

E.4 EQUIPMENT DECONTAMINATION

All metal and glassware used in the sample collection that are not certified "precleaned" will be decontaminated prior to first use, then dedicated to a specific sampling point per WHC-CM-7-7, EII 5.5.

The isopropyl alcohol, nitric acid, wash water, and deionized water rinsate will be collected in separate labeled containers for disposal according to applicable regulations.

Field meter sensors [e.g., pH, dissolved oxygen (DO), and specific conductance probes] used to monitor the process waste water will be rinsed with deionized water after measurement.

At the end of each sampling event, all equipment exposed to the process waste water will be sent to the 1706 K-East RCRA cleaning facility where it will be decontaminated. This wash water will be disposed of according to applicable regulations.

E.5 SAMPLE CUSTODY AND TRANSPORT

Samples will be routed to the selected contractor or subcontractor laboratory for analysis consistent with the Liquid Effluent QAPP (WHC 1992) and in accordance with this SAP. Samples of the 200 Area process waste water will be shipped by overnight air courier to a designated analytical laboratory.

All samples will be packaged for shipment in iced coolers. Radiological screening of a representative portion of each sample delivery group will be conducted by the laboratory in Building 222 S (see Section E.8 for more information on radiological screening). A chain-of-custody record will be generated at the time of bottle preparation and accompany the sample to the laboratory from the field. (A copy of a typical chain-of-custody record is provided in Appendix 1.) At a minimum, the following information will be provided on the chain-of-custody record by the sample team:

- All information required in the Liquid Effluent QAPP (WHC 1992)
- Chain-of-custody number
- Project name and number
- Customer name
- Project manager
- Sampler's name and title
- Sample location
- Sample identification
- Date and time of sample collection
- Type of sample (i.e., grab or composite)
- Requested analyses
- Number of containers
- Type of container, preservative, and sample volume
- Signatures of all persons having custody of the sample from collection until receipt by the laboratory
- Inclusive dates and times of sample possession

- Courier name and airbill number (remarks column)
- Corresponding sample authorization form number(s)
- Other remarks as required.

In addition, the laboratory identification number(s) will be entered on the chain-of-custody record by the laboratory sample custodian when the samples arrive at the laboratory. A copy of the signed chain-of-custody record with laboratory-assigned identification numbers written in the appropriate column is faxed to OSM to verify sample receipt. The record copy is returned to OSM with the data package.

The chain-of-custody record will be completed in ink. Any required corrections to the information provided on the chain-of-custody record will be made by drawing a line through the erroneous information, entering the correct information, and initialing and dating the change. The erroneous information should remain legible. Any unused sections of the form will have zigzag lines drawn through them to indicate information is not missing.

The original signature copy of the chain-of-custody record will be enclosed in a self-sealing plastic bag with the offsite property control form and total activity report (see Section E.8) and secured to the inside of the cooler lid. Typical sample container packaging includes the following steps. Adhesive labels on the sample bottles will be completed in waterproof ink and covered with clear plastic tape. The glass sample containers will be packaged in bubble wrap or in customized foam packing to protect them from accidental breakage during shipment. Sample bottles will be placed in individual self-sealing bags to contain leakage and then placed in a cooler. Ice (packaged in self-sealing bags) will be placed around the sample containers to keep samples cool during shipment to the laboratory. Remaining cooler space will be filled with bubble wrap. A copy of the chain-of-custody record will be retained by the sample team leader and placed in the bound field logbook. The HPT in the shipping and receiving area of Building 1163 will monitor each cooler for alpha, beta, and radon radiation of the external packaging prior to release to a courier. Final sample package preparation will include the following:

- Sealing the drain plug and lid seam with waterproof tape
- Attaching a minimum of two chain-of-custody seals in a way that they would be broken if the cooler was opened
- Attaching a shipping label
- Attaching the WHC offsite property control form and the courier's shipping papers to the lid.

As an identifying measure, each cooler will be given a unique name written with waterproof ink on the top and side of the cooler. Each time a cooler changes possession, both the person relinquishing and the person accepting custody must sign and date the chain-of-custody record. As long as the custody record is sealed inside the sample cooler and chain-of-custody seals remain intact, representatives of courier companies will not be required to sign the custody record. Shipping papers provide documentation of custody for the courier company.

OSM will telephone the laboratory each time a sample delivery group is shipped. The laboratory will be informed of the number of samples that will be arriving, the expected arrival time, and the analyses that will be required. Laboratory notification will be documented in the bound field logbook by the team member. The sample custodian receiving the samples at the laboratory shall sign and date the chain-of-custody record to acknowledge receipt of the samples. Once the samples are received at the laboratory, laboratory personnel will be responsible for maintaining internal logbooks and records that document sample custody throughout sample preparation and analysis. Further details on laboratory chain of custody are provided in the Liquid Effluent QAPP (WHC 1992). The sample team leader will transmit all shipping documentation (i.e., chain-of-custody record, total activity report, and offsite property control form, courier, and air bill number) by facsimile to OSM or a designee within 24 hours of sample shipment. The laboratory will transmit by facsimile to OSM or a designee, copies of the shipping documentation with the laboratory receipt signature within 24 hours of receiving the samples. OSM or the designee will inform the sample team leader that it was received.

E.6 SPLIT SAMPLES

EPA and Ecology may elect to collect split samples independent of the sampling effort described in this SAP. Advance written request will be needed to obtain proper clearance to these areas if EPA or Ecology exercises this option.

E.7 FIELD EQUIPMENT PREVENTIVE MAINTENANCE

Preventive maintenance for field equipment will be carried out in accordance with the manufacturer's recommended procedures and schedules. The manufacturer's operating and calibration guidelines for field instruments are available in the operations and maintenance manuals for the specific equipment. Spare parts can include batteries, replacement check valve and ball for bailers, and spare pH, dissolved oxygen, and conductivity probes. A suitable inventory of spare parts shall be maintained, as recommended by the manufacturer.

E.8 RADIOLOGICAL SCREENING

Environmental samples being sent from the Hanford Site must undergo a radiological screening analysis to monitor for radiological activity exceeding the Hanford Site release limits. This requirement applies to all samples collected as part of this project. Arrangements will be made with the 222 S Laboratory to meet this requirement and to meet the shipping deadline.

A HPT will field-screen the samples prior to their leaving the sample area. In addition, approximately 100 ml of the waste water sample from each sample point will be collected in plastic sample containers and delivered to the laboratory at Building 222 S. The analytical results (the total activity report) will be transmitted from the laboratory by facsimile machine to a predetermined Hanford Site building where the field sample team will pick it up. If the sample exhibits radioactivity at levels below the Hanford Site release limits, the sample team may take the samples (packaged in a cooler and ready for shipment in accordance with applicable Department of Transportation regulations, 49 CFR) to the Hanford Shipping and Receiving office. The resident HPT in the shipping and receiving area will monitor the sample packaging for radiation prior to its release to an overnight courier. Copies of the total activity report and offsite property control form must accompany the chain-of-custody record in the cooler (see Section E.5). Copies of all three will be retained by the sample team leader and placed in the field logbook and sample file.

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F.0 SAMPLE ANALYSIS

F.1 ANALYTICAL PARAMETERS AND PROCEDURES

The chemical parameters for analysis include the groundwater monitoring list (40 CFR 264, Appendix IX), and water quality parameters as required by the Liquid Effluent QAPP (WHC 1992). Table F-1 lists proposed analytical parameters. Tables C-1 through C-7 in Appendix 3 list specific Appendix IX parameters and the target detection limits for these parameters. Table C-7 lists target detection limits (based on EPA SW-846, latest edition) for the other parameters; the target detection limits may be redefined after final laboratory selection by OSM or designee. Actual detection limits depend on the nature of the matrix and will be reported for each parameter. The number of analytes may be reduced after a baseline is established (e.g., after the results of week 2 of Field Activity 2 or Field Activity 3 are analyzed) during 1993 sampling events.

The analytical methodology will be based on standard EPA methods; the methodology has been identified in the Liquid Effluent QAPP (WHC 1992). Standard method references for the parameters are listed in Table F-1. The analytical quality control procedures will be according to the individual EPA analytical method requirements and the Liquid Effluent QAPP (WHC 1992).

Table F-1. Sample Parameters, Holding Times, Containers, and Preservatives.

2 sheets

Parameter	R[a]	Method[b]
40 CFR 264 Appendix IX		
Total and amenable cyanide		9010, 9012
Sulfide		9030
Metals[c]	R	SW 6010/7000 series
Volatile organics (Appendix IX) and ethylene glycol		SW 8240
Semivolatile organics (Appendix IX)		SW 8270
Pesticides/polychlorinated biphenyl (PCB)		SW 8080
Organophosphate pesticides		SW 8140
Chlorinated herbicides		SW 8150
Field parameters		
pH	R	SW 9040
Conductivity	R	SW 9050
Water quality		
Total organic carbon (TOC)	R	SW 9060
Total organic halogens (TOX)		SW 9020
Turbidity	R	EPA 180
Alkalinity	R	EPA 310.1
Total phenols		EPA 420.1
Chemical oxygen demand (COD)	R	EPA 410.1
Fluoride	R	EPA 340.2
Chloride	R	EPA 325.3
Sulfate	R	EPA 375.1

Table F-1. Sample Parameters, Holding Times, Containers, and Preservatives.

2 sheets

Water quality (continued)		
Sulfite	R	EPA 377.1
Nitrate	R	9200
Nitrite	R	EPA 354.1
Ammonia	R	EPA 350.1, .2, or .3
Radiological		
Gross alpha/beta	R	[d]
Onsite rad. screen		

[a]R = Routine analysis parameter.

[b]Methods are from EPA SW-846 (latest edition), EPA 1983, or APHA 1989.

[c]These parameters are sensitive to residual chlorine.

[d]Radionuclides will be analyzed by methods that meet or exceed EPA or Nuclear Regulatory Commission guidelines. Methods and requirements shall be defined by the laboratory prior to analyses.

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G.0 REFERENCES

40 CFR 264, 1991, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*, as amended.

49 CFR, 1991, "Transportation," *Code of Federal Regulations*, as amended.

APHA-AWWA-WPCF, 1989, *Standard Methods for the Examination of Water and Wastewater*, 17th edition, Washington, D.C.

DOE, 1988, *General Environmental Protection Program*, U.S. Department of Energy, DOE Order 5400.1, Washington, D.C.

Ecology, EPA, and DOE, 1990, *Hanford Federal Facility Agreement and Consent Order*, 2 Vols., as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, U.S. Department of Energy, Olympia, Washington.

Ecology, 1990a, "Dangerous Waste Regulations," *Washington Administrative Code*, Chapter 173-303, as amended, Washington State Department of Ecology, Olympia, Washington.

Ecology, 1990b, "State Waste Discharge Permit Program," *Washington Administrative Code*, Chapter 173-216, as amended, Washington State Department of Ecology, Olympia, Washington.

Ecology, 1990c, "Submission of Plan and Reports for Construction of Waste Water Facilities," *Washington Administrative Code* 173-240, as amended, Washington State Department of Ecology, Olympia, Washington.

EPA, 1983, *Methods for Chemical Analysis of Water and Waste*, U.S. Environmental Protection Agency, Cincinnati, Ohio.

EPA, latest edition, *Test Methods for Evaluating Solid Waste*, SW-846, U.S. Environmental Protection Agency, Washington, D.C.

WHC, 1989, *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7, Westinghouse Hanford Company, Richland, Washington.

WHC, 1990, *183-D Filter Backwash Stream-Specific Report*, WHC-EP-0342, Addendum 33, Westinghouse Hanford Company, Richland, Washington.

WHC, 1991a, *Facility Effluent Monitoring Plan for the 284 E and 284 W Power Plants*, WHC-EP-0472, Westinghouse Hanford Company, Richland, Washington.

WHC, 1991b, *Quality Assurance Project Plan for Facility Effluent Monitoring Plan Activities*, WHC-EP-0446, Westinghouse Hanford Company, Richland, Washington.

WHC, 1992, *Liquid Effluent Sampling Quality Assurance Program Plan*, WHC-SD-WM-QAPP-011, Rev. 2A, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX 1

TYPICAL CHAIN-OF-CUSTODY FORM

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CHAIN OF CUSTODY RECORD

CHAIN OF CUSTODY RECORD

PROJECT NUMBER	PROJECT NAME	# OF CONTAINERS	CLIENT ADDRESS AND PHONE NUMBER	LAB ID	FOR LAB USE ONLY
CLIENT NAME			ANALYSES REQUESTED		LAB#
PROJECT MANAGER	COPY TO:				LAB#
REQUESTED COMP. DATE	SAMPLING REQUIREMENTS: SDWA ☐ NPDES ☐ RCRA ☐ OTHER ____				PROJECT NO.
					ACK / VERIFIED
					QUOTE# / BS
					NO. OF SAMP / PG / OF

STA NO.	DATE	TIME	COMP	GRAB	SOIL	SAMPLE DESCRIPTIONS (12 CHARACTERS)	# OF CONTAINERS											LAB ID	REMARKS

SAMPLED BY AND TITLE	DATE/TIME	RELINQUISHED BY	DATE/TIME	HAZWRAP/NEESA Y N
				QC LEVEL 1 2 3
RECEIVED BY:	DATE/TIME	RELINQUISHED BY:	DATE/TIME	COC / ICE
				ANA REQ / TEMP
RECEIVED BY:	DATE/TIME	RELINQUISHED BY:	DATE/TIME	CUST SEAL / Ph
				SAMPLE COND
RECEIVED BY LAB:	DATE/TIME	SAMPLE SHIPPED VIA UPS BUS FED-EX HAND OTHER ____	AIR BILL #	
REMARKS			ENTERED INTO LIMS ____	COC REVIEWED ____

CHAIN OF CUSTODY RECORD

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APPENDIX 2

EVALUATION OF AVAILABLE DATA

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EVALUATION OF AVAILABLE DATA

To develop a defensible sampling strategy and rationale, the available existing data had to be reviewed and evaluated. WHC sampled waste water from the 284 W Powerplant, including water softener regeneration and mud drum blowdown and specific streams constituting batch input to the powerplant continuous blowdown. Analytical data of detected analytes, tabulated in the Operations Support Services Department August 1990 report, *284 W Powerplant Wastewater Stream-Specific Report* (WHC 1990), have been evaluated in preparation of the proposed sampling program. Table 2-1 summarizes the sampling dates and count of analyses for each of the three streams across the chemical classes of inorganic/metals, radioactivity, organic compounds, including volatile and semivolatiles, and water quality.

Samples from the two batch blowdown streams and from the continuous blowdown were collected independently, over three time periods. Mud drum blowdown was sampled between September 1985 and January 1987. Parameters quantified and detected represented between 4 and 7 sampling events over this time frame and consisted of predominantly inorganics and metals and the two measures of gross radioactivity. Limited subsets of organic (four analytes) and water quality (three analytes) parameters were detected over the period the mud drum blowdown was sampled. In November 1987, a similar subset of parameters were quantified and detected from samples collected from the softener regeneration stream. Between November 1987 and April 1988, analytes were quantified from a single to a maximum of eight samples. Sampling of the continuous blowdown began in July 1988 and continued through March 1990. The set of analytes quantified and detected was more extensive, particularly in terms of water quality parameters. Sampling and/or detection frequencies varied among parameters with the majority of detected parameters represented by nine observations over the 20-month period.

The lack of overlap in the sampling periods for the three discharge components limits interpretation of the available data. Parameter concentrations from the continuous blowdown, collected when neither of the batch blowdown streams are discharged, underestimates contaminant levels that would occur at least occasionally (during batch discharge of boiler and regenerate blowdown). Sampling these streams independently could provide a worst case for treatment designs. However, these are only required if worst-case concentrations reaching the 284 WB percolation pond exceed acceptable levels.

Table 2-1. Westinghouse 284 W Powerplant Sampling Summary Data Summary.
2 sheets

Sample dates	07/88 - 03/90	11/87 - 04/88	09/85 - 01/87
Analytical class analytical parameter	Number of samples continuous blowdown	Number of samples softener regeneration	Number of samples boiler blowdown
Inorganic/metal			
Alkalinity	4		
Aluminum	9	4	5
Ammonia	9	4	5
Arsenic	4		
Barium	13	4	5
Boron	5		
Cadmium	13	4	5
Calcium	9	4	5
Chloride	9	4	5
Chromium	4		5
Cobalt	5		
Copper	9	4	5
Fluoride	18	8	
Iron	8	4	5
Lead	13	4	3
Lithium	5		
Magnesium	9	4	5
Manganese	9	4	5
Mercury	13		5
Nickel		4	
Nitrate	9		5
Phosphate			5
Potassium	9	4	5
Reactivity cyanide	4		
Reactivity sulfide	4		
Selenium	4		
Silicon	5		
Silver	4		
Sodium	9	4	5
Strontium	9	4	
Sulfate	9	4	5

Table 2-1. Westinghouse 284 W Powerplant Sampling Summary Data Summary.
2 sheets

Sample dates	07/88 - 03/90	11/87 - 04/88	09/85 - 01/87
Analytical class analytical parameter	Number of samples continuous blowdown	Number of samples softener regeneration	Number of samples boiler blowdown
Inorganic/metal (continued)			
Uranium	8	4	5
Vanadium	9		
Zinc	9	4	5
Radioactivity			
Alpha activity		2	4
Beta activity	7	3	5
Organic			
Total organic carbon (TOC)	9	2	5
Total carbon	4		
Total organic halogens (TOX) (as Cl)	9	4	5
Volatile organic (VOA)			
2-Butanone	22		
Dichloromethane		8	7
Pentachloroethane	22		
1,1,1-Trichloroethane		8	
Trichloromethane	22	8	7
Semivolatile organic (Acid/Base Neutral [ABN])			
Diacetone alcohol		1	
Hexadecanoic acid	1		
Pentachloroethane	1		
1,2,3,3-Tetrachloropropene	1		
Unknown ABN	2		
Water quality			
Conductivity	9	3	5
Ignitability	4		
pH	9	4	5
Suspended solids	4		
Total dissolved solids (TDS)	4		
Temperature	9	4	5

Coincidental sampling will address these data gaps and provide a more complete understanding of the relative influence of intermittent sources on contaminant levels in the powerplant and entire 284 discharge.

Inspection of available results from the continuous blowdown indicated that several parameters, primarily inorganics, exhibited pronounced increases in the levels detected from the final sample collected in March 1990. Levels of these parameters (including barium, cadmium, calcium, chloride, magnesium, mercury, potassiums, sodium, strontium, conductivity, and total dissolved solids [TDS]) ranged between 5 and 1,000 times levels previously recorded, levels that approached concentrations found in the water softener regeneration samples collected two to three years earlier.

Figures 2-1 and 2-2 present time series of a subset of parameters: calcium, chloride, and conductivity, and gross alpha radiation, gross beta radiation, and conductivity, respectively. The time axis represents the time period between the first mud drum blowdown sample collected (September 1985) and the final continuous discharge sample collected (March 1990), approximately 60 months. The axis is divided into sequential months. The points have been coded B for boiler blowdown, S for softener regeneration, and C for continuous routine discharge sample results. Data have been transformed to natural logs to facilitate interpretation. Where Washington groundwater quality criteria exist, the criterion level has been indicated with a broken line.

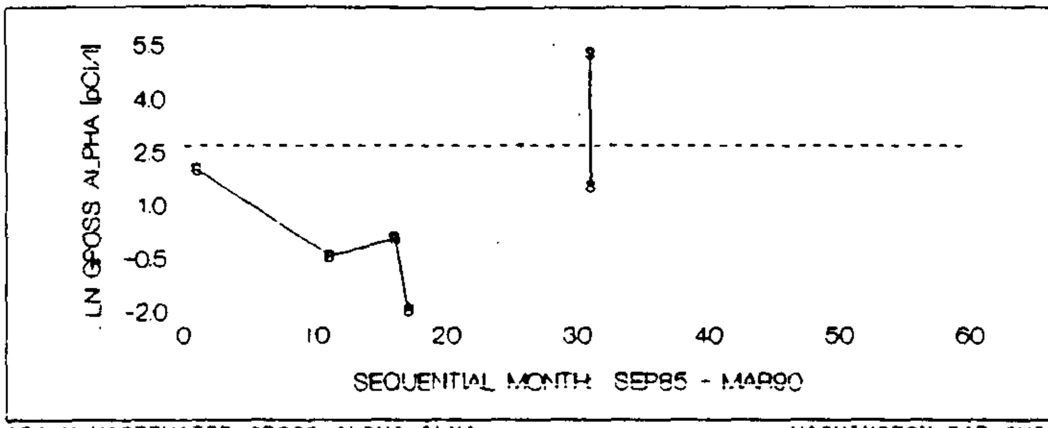
The time series plots illustrate the following.

- There are no data where batch blowdowns (S and B) and continuous blowdown (C) coincide. Data from two batch blowdowns were collected between September 1985 and January 1987 and November 1987 and April 1988, respectively. Continuous blowdown sampling occurred both prior to (July 1988 to March 1989) and following (November 1989 to March 1990) implementation of a rigorous data validation program in October 1989. Because of the timing of previous studies, no relationship can be drawn between batch blowdowns, continuous blowdown, and the combined waste water stream leaving the 284 W powerhouse.

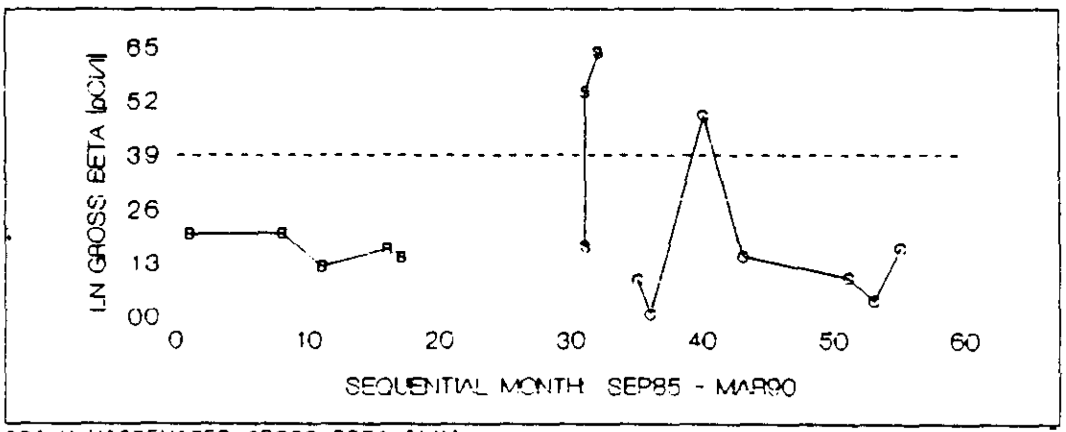
- The same suite of parameters was not measured in the different waste water streams. For example, gross alpha and beta were reported for water softener regeneration, but gross alpha was not measured in the continuous blowdown. The specific source of gross alpha cannot be related to a particular process because the same parameters were not measured in each of the different source waste streams.

- Because the ponds may be recharging groundwater, the Washington groundwater standards (*Washington Administrative Code* [WAC] 173-200) were compared to existing data. WAC 173-200-040(2)(b) states that the most stringent criteria should be used for: groundwater quality criteria, Federal maximum contaminant level

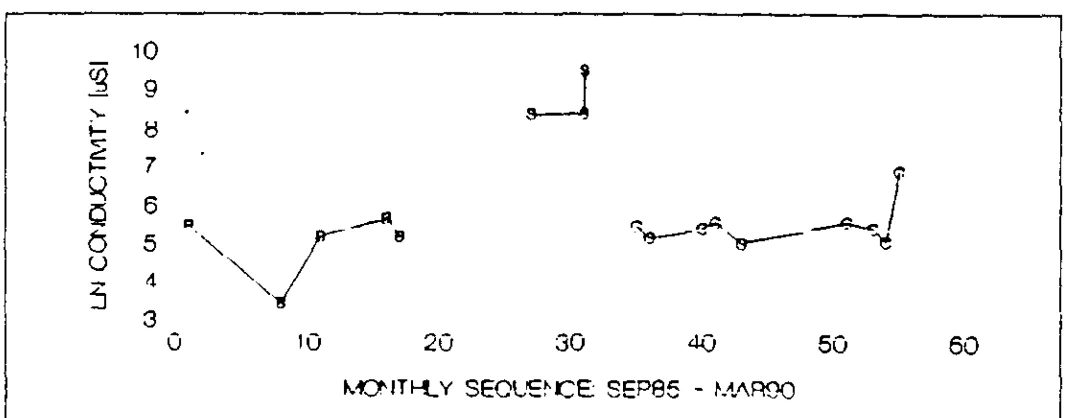
Figure 2-1.



284-W WASTEWATER GROSS ALPHA [LN] ---- WASHINGTON RAD GWQC



284-W WASTEWATER GROSS BETA [LN] ---- WASHINGTON RAD GWQC

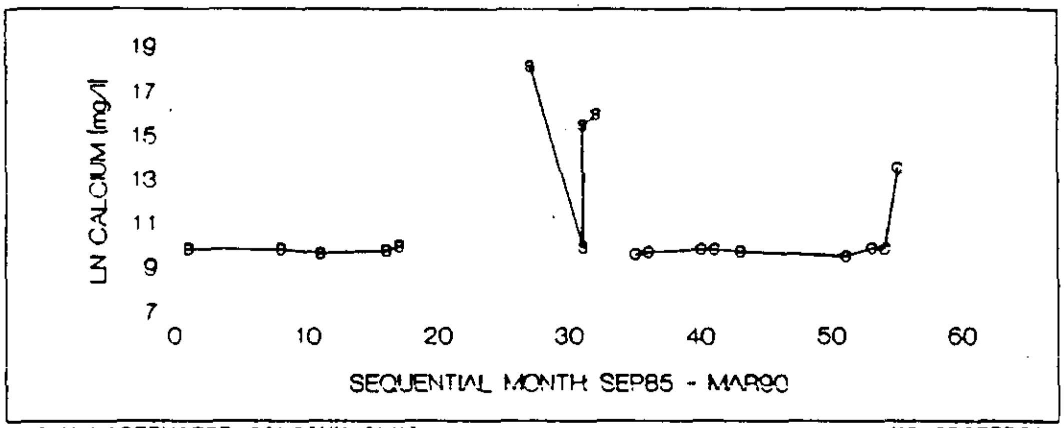


284-W WASTEWATER CONDUCTIVITY [LN] NO CRITERION

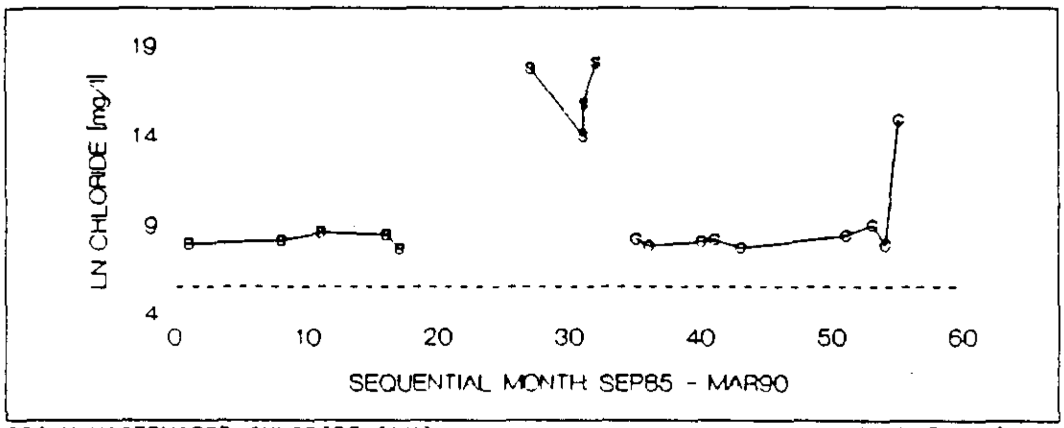
LEGEND

B	Mud drum blowdown
S	Water softener regeneration
C	Continuous blowdown
pCi/l	picoCuries per liter
µS	microSiemens

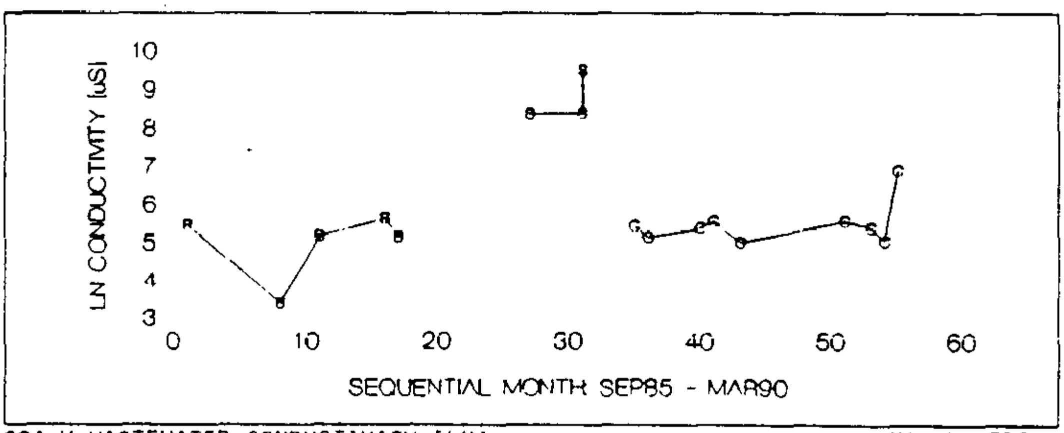
Figure 2-2.



284-W WASTEWATER CALCIUM [LN] NO CRITERION



284-W WASTEWATER CHLORIDE [LN] ---- WASHINGTON 2° MCL



284-W WASTEWATER CONDUCTIVITY [LN] NO CRITERION

LEGEND

- B Mud drum blowdown
- S Water softener regeneration
- C Continuous blowdown
- pCi/l picoCuries per liter
- µS microSiemens

goals (MCLGs), Federal maximum contaminant levels (MCLs), or the State MCLs. Chloride, conductivity, alpha, and beta criteria (dotted lines on Figures 2-1 and 2-2) are exceeded by some and/or all waste streams monitored to date. The criterion for chloride is the Washington State Secondary Drinking Water Standard (SDWS) MCL. The gross alpha and beta criteria are the Washington State Groundwater Quality Criteria.

- In general, concentrations from the water softener regeneration (S) are much greater than the mud drum blowdown (B) which, in turn, is comparable to concentrations measured in the continuous blowdown (C).

- Conductivity seems to provide a field measurement which tracks variations in other parameters. This relationship may be useful in finalizing sample locations in the field.

In addition, preliminary examination of WHC data indicates that a more extensive analysis may detect parameters that we have not yet evaluated. For example, although pentachloroethane (a semivolatile compound) was quantified by volatile analysis on eight dates, it was detected only when analyzed as a semivolatile. It is anticipated that more parameters will be detected when the 40 CFR 264 Appendix IX list is used for sample analysis.

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APPENDIX 3

ANALYTICAL PARAMETERS

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Table 3-1. 40 CFR 264 Appendix IX Volatile Organics Method 8240[a].

2 sheets

Parameter	Target water quantitation limit (µg/l)
Acetone	25
Acetonitrile	100
Acrolein	100
Acrylonitrile	100
Allyl chloride	5.0
Benzene	5.0
Bromodichloromethane	5.0
Bromoform	5.0
Bromomethane (methylbromide)	10
Carbon disulfide	5.0
Carbon tetrachloride	5.0
Chlorobenzene	5.0
Chloroprene	5.0
Chloroethane	10
Chlorodibromomethane	5.0
Chloroform	5.0
Chloromethane	10
DBCP (1,2-dibromo-3-chloropropane)	5.0
EDB (1,2-dibromoethane)	5.0
Dibromomethane	5.0
Trans-1,4-dichloro-2-butene	5.0
Dichlorodifluoromethane	10
1,1-Dichloroethane	5.0
1,2-Dichloroethane	5.0
1,2-Dichloroethene (total)	5.0
1,1-Dichloroethene	5.0
Dichloromethane	25

Table 3-1. 40 CFR 264 Appendix IX Volatile Organics Method 8240[a].

2 sheets

Parameter	Target water quantitation limit (µg/l)
1,2-Dichloropropane	5.0
cis-1,3-Dichloropropene	5.0
Trans-1,3-dichloropropene	5.0
1,4-Dioxane	100
Ethyl benzene	5.0
Ethyl cyanide	5.0
2-Hexanone	10
Iodomethane	5.0
Isobutyl alcohol	100
Methacrylonitrile	5.0
Methyl ethyl ketone (2-butanone)	25
4-Methyl-2-pentanone	10
Styrene	5.0
1,1,1,2-Tetrachloroethane	5.0
1,1,2,2-Tetrachloroethane	5.0
Tetrachloroethene	5.0
Toluene	5.0
1,1,1-Trichloroethane	5.0
1,1,2-Trichloroethane	5.0
Trichloroethene	5.0
Trichlorofluoromethane	5.0
1,2,3-Trichloropropane	5.0
Vinyl acetate	10
Vinyl chloride	10
Total xylenes	5.0

[a]Method 8240 must be modified to include all the listed parameters. The method is from EPA SW-846 (latest edition).

Table 3-2. 40 CFR 264 Appendix IX Semivolatile Organics Method 8270[a].

5 sheets

Parameter	Target water quantitation limit (µg/l)
Acenaphthene	10
Acenaphthylene	10
Acetophenone	10
2-Acetylaminofluorene	10
4-Aminobiphenyl	10
Aniline	10
Aramite	10
Benzo(a)anthracene	10
Benzo(b)fluoranethene	10
Benzo(k)fluoranthene	10
Benzo(g,h,i)perylene	10
Benzo(a)pyrene	10
Benzyl alcohol	20
4-Bromophenyl phenyl ether	10
Butyl benzyl phthalate	10
2-Sec-butyl-4,6-dinitrophenol (dinoseb)	10
4-Chloroaniline	20
4-Chloro-3-methylphenol	20
2-Chloronaphthalene	10
2-Chlorophenol	10
4-Chlorophenyl phenyl ether	10
o-Cresol	10
M & p-cresol(s)	10
Chrysene	10
Dibenzo(a,h)anthracene	10
Dibenzofuran	10
Di-n-butyl phthalate	10

Table 3-2. 40 CFR 264 Appendix IX Semivolatile Organics Method 8270[a].

5 sheets

Parameter	Target water quantitation limit (μg/l)
1,2-Dichlorobenzene	10
1,3-Dichlorobenzene	10
1,4-Dichlorobenzene	10
3,3'-Dichlorobenzidine	20
2,4-Dichlorophenol	10
2,6-Dichlorophenol	10
Diethyl phthalate	10
Dimethoate	--
p-Dimethylaminoazobenzene	10
7,12-Dimethylbenzanthracene	10
3,3'-Dimethylbenzidine	10
a,a-Dimethylphenethylamine	10
2,4-Dimethylphenol	10
Dimethyl phthalate	10
1,3-Dinitrobenzene	10
4,6-Dinitro-o-cresol	50
2,4-Dinitrophenol	50
2,4-Dinitrotoluene	10
2,6-Dinitrotoluene	10
Di-n-octyl phthalate	10
Diphenylamine	10
Disulfoton	--
Dimethoate	--
Bis(2-chloroethyl)ether	10
Bis(2-chloroisopropyl)ether	10
Ethyl methacrylate	10
Ethyl methanesulfonate	10

Table 3-2. 40 CFR 264 Appendix IX Semivolatile Organics Method 8270[a].

5 sheets

Parameter	Target water quantitation limit ($\mu g/l$)
Ethyl parathion	--
Famphur	--
Fluoranethene	10
Fluorene	10
Hexachlorobenzene	10
Hexachlorobutadiene	10
Hexachlorocyclopentadiene	10
Hexachloroethane	10
Hexachlorophen	--
Hexachloropropene	20
Indeno(1,2,3-c,d)pyrene	10
Isophorone	10
Isosafrole	20
Bis(2-chloroethoxy)methane	10
Methapyrilene	10
3-Methylcholanthrene	20
Methyl methacrylate	10
Methyl methanesulfonate	10
2-Methylnaphthalene	10
Methyl parathion	10
Naphthalene	10
1,4-Naphthoquinone	10
1-Naphthylamine	10
2-Naphthylamine	10
2-Nitroaniline	50
3-Nitroaniline	50
4-Nitroaniline	50

Table 3-2. 40 CFR 264 Appendix IX Semivolatile Organics Method 8270[a].

5 sheets

Parameter	Target water quantitation limit (μg/l)
Nitrobenzene	10
2-Nitrophenol	10
4-Nitrophenol	50
4-Nitroquinoline-1-oxide	--
N-Nitrosodi-n-butylamine	01
N-Nitrosodiethylamine	10
N-Nitrosodimethylamine	01
N-Nitrosodiphenylamine	10
N-Nitroso-di-n-propylamine	10
N-Nitrosomethylethylamine	10
N-Nitrosomorpholine	10
N-Nitrosopiperidine	10
N-Nitrosopyrrolidine	10
5-Nitro-o-toluidine	10
Pentachlorobenzene	10
Pentachloroethane	10
Pentachloronitrobenzene	50
Pentachlorophenol	50
Phenacetin	10
Phenanthrene	10
Phenol	10
p-Phenylenediamine	--
Phorate (thimet)	--
Bis(2-ethylhexyl)phthalate	10
2-Picoline	10
Pronamide	20
Pyrene	10

Table 3-2. 40 CFR 264 Appendix IX Semivolatile Organics Method 8270[a].

5 sheets

Parameter	Target water quantitation limit (μg/l)
Pyridine	--
Safrole	10
Sulfotepp	--
1,2,4,5-Tetrachlorobenzene	10
2,3,4,6-Tetrachlorophenol	20
Thionazin	--
o-Toluidine	10
2,4,6-Tribromophenol	--
1,2,4-Trichlorobenzene	10
2,4,5-Trichlorophenol	50
2,4,6-Trichlorophenol	10
o,o,o-Triethylphosphorothioate	--
Sym-trinitrobenzene	10

[a]Method 8270 must be modified to include all of the indicated parameters. Method 8270 is from EPA SW-846 (latest edition).

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Table 3-3. 40 CFR 264 Appendix IX Organochlorine Pesticides/PCBs Method 8080[a].

2 sheets

Parameter	Target water quantitation limit (mg/l)
Aldrin	0.050
Aroclor-1016	0.50
Aroclor-1221	0.50
Aroclor-1232	0.50
Aroclor-1242	0.50
Aroclor-1248	0.50
Aroclor-1254	1.0
Aroclor-1260	1.0
Alpha-BHC	0.050
Beta-BHC	0.050
Delta-BHC	0.050
Gamma-BHC (lindane)	0.050
Chlordane	0.50
Chlorobenzilate	0.50
4,4'-DDD	0.10
4,4'-DDE	0.10
4,4'-DDT	0.10
Diallate	1.5
Dieldrin	0.10
Endosulfan I	0.050
Endosulfan II	0.10
Endosulfan sulfate	0.10
Endrin	0.10
Endrin aldehyde	0.10
Heptachlor	0.050
Heptachlor epoxide	0.050

Table 3-3. 40 CFR 264 Appendix IX Organochlorine Pesticides/PCBs Method 8080[a].

2 sheets

Parameter	Target water quantitation limit (mg/l)
Isodrin	0.050
Kepone	0.10
Methoxychlor	0.50
Toxaphene	1.0

[a]Method 8080 must be modified to include all of the listed parameters. Method 8080 is from EPA SW-846 (latest edition).

Table 3-4. 40 CFR 264 Appendix IX Herbicides Method 8150[a]

Parameter	Target water detection limit ($\mu g/l$)
2,4-D(2,4-dichlorophenoxyacitic acid)	12
2,4,5-T (2,4,5-trichlorophenoxyacetic acid)	2
2,4,5-TP (silvex; 2,4,5-trichlorophenoxypropanoic acid)	2

[a]Method 8150 is from EPA SW-846 (latest edition).

Table 3-5. 40 CFR 264 Appendix IX Dioxins and Furans Method 8280[a]

Parameter	Target practical quantitation limits (ng/l)
Dioxins	
Total tetrachlorodibenzo-p-dioxins	10
2,3,7,8-Tetrachlorodibenzo-p-dioxin	5
Total pentachlorodibenzo-p-dioxins	10
Total hexachlorodibenzo-p-dioxins	10
Total heptachlorodibenzo-p-dioxin[b]	--
Octachlorodibenzo-p-dioxin[b]	--
Furans	
Total tetrachlorodibenzofurans	10
Total pentachlorodibenzofurans	10
Total hexachlorodibenzofurans	10
Total heptachlorodibenzofuran[b]	--
Octachlorodibenzofuran[b]	--

[a]Method 8280 is from EPA SW-846 (latest edition).

[b]These parameters are not on the 40 CFR 246 Appendix IX list, but have been added in accordance with the Liquid Effluent Quality Assurance Program Plan (WHC 1992).

APPENDIX REFERENCES

40 CFR 264, 1991, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*, as amended.

APHA-AWWA-WPCF, 1989, *Standard Methods for the Examination of Water and Wastewater*, 17th edition, Washington, D.C.

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EPA, latest edition, *Test Methods for Evaluating Solid Waste*, SW-846, U.S. Environmental Protection Agency, Washington, D.C.

WAC 173-200, 1990, "Water Quality Standards for the State of Washington," *Washington Administrative Code*, as amended.

WHC, 1990, *183-D Filter Backwash Stream-Specific Report*, WHC-EP-0342, Addendum 33, Westinghouse Hanford Company, Richland, Washington.

WHC, 1992, *Liquid Effluent Sampling Quality Assurance Program Plan*, WHC-SD-WM-QAPP-011, Rev. 2A, Westinghouse Hanford Company, Richland, Washington.

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Table 3-6. Metals.

Parameter	Target water detection limit (mg/l)	Analytical method[a]
Appendix IX metals		
Antimony	0.032	6010
Arsenic	0.001	7060
Barium	0.002	6010
Beryllium	0.0003	6010
Cadmium	0.004	6010
Chromium	0.007	6010
Cobalt	0.007	6010
Copper	0.006	6010
Lead	0.001	7421, 7420
Mercury	0.0002	7470
Nickel	0.015	6010
Selenium	0.002	7740
Silver	0.007	6010
Thallium	0.001	7841
Tin	0.8	7870
Vanadium	0.008	6010
Zinc	0.002	6010
Additional metals		
Aluminum	0.045	6010
Calcium	0.01	7140
Iron	0.03	7380
Magnesium	0.001	7450
Manganese	0.01	7460
Potassium	0.01	7610
Sodium	0.002	7770

[a]Methods are from EPA SW-846 (latest edition).

Table 3-7. General Parameters.

Parameter	Target water detection limit (mg/l)	Analytical method
Appendix IX parameters		
Cyanide, total	0.01	335[a]
Sulfide, total	0.05	376[a]
Additional parameters		
Alkalinity	1.0	310[a]
Ammonia	0.01	350[a]
Chloride	1.0	325[a]
COD (chemical oxygen demand)	9	410[a]
Coliform (fecal)	1 colony/100 ml.	908C[c]
Coliform (total)	1 colony/100 ml.	908A[c]
Conductivity	--	9050[b]
Cyanide (amenable)	0.01	335[a]
Fluoride	0.1	340[a]
Nitrate	0.03	352[a]
Nitrite	0.02	354[a]
pH	--	9040[b]
Phenols (total)	--	420[a]
Sulfate	1.0	375[a]
Sulfite		377[a]
TOC (total organic carbon)	1.0	9060[b]
TOX (total organic halogens)	0.1	9020[b]
Turbidity	--	180[a]

[a]Methods are from EPA 1983.
[b]Methods are from EPA SW-846 (latest edition).
[c]Methods are APHA 1989.

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